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## A review of the New Guinea species of *Chimarra* Stephens (Trichoptera: Philopotamidae)

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### Abstract

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Descriptions are provided for males of 58 philopotamid species in the Trichoptera (caddisfly) genus *Chimarra* Stephens. Among these are 49 new species from New Guinea (Papua New Guinea and the Indonesian province of Papua/ West Papua, including nearby islands): 41 new species from Papua New Guinea, seven from West Papua and one found in both (*C. bifida* sp. nov.). The new species are: *Chimarra absida* sp. nov., *C. alicae* sp. nov., *C. antap* sp. nov., *C. bicornis* sp. nov., *C. bicuspidis* sp. nov., *C. bifida* sp. nov., *C. bintang* sp. nov., *C. cavata* sp. nov., *C. clava* sp. nov., *C. cristata* sp. nov., *C. damma* sp. nov., *C. denticulata* sp. nov., *C. ediana* sp. nov., *C. erecta* sp. nov., *C. espelandae* sp. nov., *C. harpes* sp. nov., *C. huonana* sp. nov., *C. ismayi* sp. nov., *C. jari* sp. nov., *C. johansonii* sp. nov., *C. karamui* sp. nov., *C. kebarana* sp. nov., *C. kewabi* sp. nov., *C. kuka* sp. nov., *C. laensis* sp. nov., *C. lalokiana* sp. nov., *C. lindiae* sp. nov., *C. maai* sp. nov., *C. mendiana* sp. nov., *C. milneana* sp. nov., *C. missim* sp. nov., *C. morobensis* sp. nov., *C. newguineana* sp. nov., *C. olahi* sp. nov., *C. pertica* sp. nov., *C. pindua* sp. nov., *C. projectura* sp. nov., *C. sappela* sp. nov., *C. sepikana* sp. nov., *C. simbuensis* sp. nov., *C. stella* sp. nov., *C. supia* sp. nov., *C. toliana* sp. nov., *C. trigona* sp. nov., *C. ukarumpana* sp. nov., *C. unidentata* sp. nov., *C. verticis* sp. nov., *C. wara* sp. nov. and *C. wauana* sp. nov. Only one described species (*C. cyclopica* Kimmins, 1962) is shared by the two adjoining countries. Species separation is based almost entirely on male genitalic characteristics. The *C. papuana* species group (after Mey, 2006; Oláh, 2014) is reaffirmed; its key features being inferior appendages with the sub-terminal or terminal process elongate and an elongate ventral process on segment IX. All 58 species treated here are endemic to New Guinea, except for *C. biramosa*, which was originally recorded from the nearby Solomon Islands (Kimmins, 1957).

### Keywords

Trichoptera, caddisfly, Philopotamidae, *Chimarra*, Papua New Guinea, Papua Province, Indonesia

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## Introduction

*Chimarra* is a cosmopolitan and very speciose genus, currently including some 885 described species (Morse, 2018). This study of the genus in New Guinea and its offshore islands increases the total by 49 new species and revises nine species. Records of *Chimarra* in New Guinea began with the description of *C. loriana* by Navás (1933), and by 2016, additions by various authors had increased the number of species to 77. With the newly described species, the total is now 126 species.

The island of New Guinea (total area about 786 000 km<sup>2</sup>) comprises the mainland parts of Papua New Guinea (PNG) and Indonesian Papua/West Papua. PNG, the easternmost section (total area about 462 840 km<sup>2</sup>) of New Guinea, includes the New Britain, New Ireland and Bougainville islands and numerous other small offshore islands). The western section, Papua (formerly Irian Jaya; total area about 318 000 km<sup>2</sup>), includes adjacent islands such as Batanta (area about 453 km<sup>2</sup>) and Biak (area about 2455 km<sup>2</sup>).

New Guinea is situated just north of Australia and slightly south of the equator. New Guinea extends to the south at 11° 30' south (Milne Bay area, PNG), west to nearly 132°E (W Papua) and east to 156°E (Bougainville Island, PNG). The Indonesian–PNG border is situated north to south at about 141°E. The climate of New Guinea is mainly tropical but is modified by a spine of mountain ranges that runs west to east. The highest points are Mount Wilhelm (PNG), at 4509 m, and Puncak Jaya or Carstensz Pyramid (Papua), at 4884 m.

The genus *Chimarra* was first described in 1829 for a British

species, *C. marginata* Stephens. Subsequent major studies by Ross (1956), Blahnik (1998) and Blahnik et. al (2009) have redefined the genus.

In the Australasian biogeographical region, 143 *Chimarra* species have been described previously: 28 from Australia (Cartwright, 2002; Neboiss, 2003), 77 from New Guinea (Morse, 2018; Oláh, 2012a, not 16–17 as included in table 1; Wells and Johanson, 2016), 27 from the Fiji islands (Johanson and Oláh, 2012; Morse, 2018), 11 from the Solomon Islands (Johanson and Espeland, 2010) and one from New Caledonia (Johanson and Espeland, 2010; Morse, 2018; contra the 105 species of Wahlberg and Johanson, 2014). The description of 49 new species in this paper (from only 94 specimens) brings the regional total to 192, or nearly one quarter of the world's known *Chimarra* fauna. Interestingly, 29 species are described from Batanta Island (Oláh, 2012b, 2013, 2014, 2016, 2018), which is off the west coast of New Guinea and has an area of 453 km<sup>2</sup>. This is nearly as many species as for the whole of nearby mainland Papua (33 species; area about 318 000 km<sup>2</sup>) and nearly half as many as in PNG *Chimarra* fauna (66 species). This reinforces the notion that *Chimarra* species are under collected and that the biodiversity of New Guinea is probably greatly under-estimated. Similarly, for Indonesia overall, with 106 species of *Chimarra* recorded (not 81 species as listed in Morse, 2018), about half of which are found in Papua (54 species, including Batanta Island).

In this taxonomic revision of New Guinea *Chimarra*, 128 male specimens were examined and referred to 58 species. Each of the 49 new species is known from fewer than eight specimens; 29 species are known from only the holotype male. Of the new species, 42 are recorded from PNG and 8 from Papua (including one from both – *C. bifida*).

Neboiss (1984) briefly compared the Trichoptera faunas of mainland Australia, Tasmania, New Guinea (including West Papua, PNG, New Britain and several PNG islands) and “SW Pacific islands”. A few years later, Neboiss (1987b) carried out a preliminary comparison of the Trichoptera faunas of Sulawesi, New Guinea and Cape York Peninsula (north-east tip of Australia). He noted that 16 species of *Chimarra* were recorded from New Guinea (as illustrated in Neboiss, 1986a), but there were no *Chimarra* species in common between any two of the three regions. Wells and Johanson (2016) revisited Neboiss' (1984) work and updated his totals with current estimates. They noted only 17 species of Philopotamidae (all *Chimarra*? in their Table 1) from New Guinea compared with Neboiss' (1984, 1986a) estimates of 16.

The biogeographic analyses by Wahlberg and Johanson (2014) revealed an origin for *Chimarra* in the Neotropical region and a subsequent rapid radiation with dispersal into the Oriental, Palaearctic and Australasian regions and secondarily to the Nearctic region (Wahlberg and Johanson, 2014). Most of the species of *Chimarra* from south-east Asia can be divided into two distinctive groups. These correspond to the “lineages” discussed by Ross (1956) and characterised by the species *C. digitata* Martynov and *C. tsudai* Ross. Both groups, as is typical of the species currently placed in the subgenus *Chimarra*, are characterised by male genitalia with tergum X divided and widely separated mesally into paired, sclerotised lateral lobes

(Blahnik, 1998, fig. 9A–B). Both groups are widespread and species rich in Asia, with members of the *digitata* group also occurring in the New World, Africa, and extending into some Pacific islands and eastern Australia (Blahnik et al., 2009). Members of the *digitata* group have genitalia with exactly two hair-like sensilla on the lateral lobes of tergum X and an apically divided membranous mesal lobe; whereas members of the *tsudai* group have genitalia with the lateral lobes of tergum X subdivided into sclerotised lateral and mesal lobes and have numerous sensilla. The New Guinea species probably belong to the *digitata* group (Blahnik et al., 2009).

A group of New Guinea species (*C. papuana* Kimmins, *C. schmidi* Kimmins, *C. sabrona* Kimmins and *C. guentheri* Mey) was initially defined by Mey (2006) to share the following combination of derived characters states: in the hind wings, A2 does not form a loop but is incomplete or atrophied; in the forewings, the stem of Rs is strongly sinuous with a thickening before and at the base of the discoidal cell; and the ninth segment bears a ventral long, straight process. Later, the *papuana* group was re-defined by Oláh (2014) to include *C. kozela* Oláh and Mey and *C. kaliya* Oláh, as having long and arching filiform dorsoapical process on gonopods (inferior appendages). Four new species described here can be aligned to this group (personal observation). No clear groupings are discerned among most of the New Guinea species.

## Methods and materials

Among *Chimarra* species, size and body and wing colour can be useful characters but are variable. Colour can be a useful character in live or freshly preserved material but it often

fades in alcohol with time. Most of the *Chimarra* specimens examined in this study were dried and pinned specimens that were over 45 years old and many were in poor condition. Some were stored in alcohol, many for over twenty years. Most of the material studied was on loan from Museum Victoria. Depositories for specimens are abbreviated as follows: Bernice P. Bishop Museum, Honolulu, Hawaii, USA (BPBM), Museum of Victoria, Melbourne, Australia (NMV), Queensland Museum, Brisbane, Queensland (QM), National Natural History Museum, Leiden, Netherlands (RMNH) and Natural History Museum, London, England (BMNH).

Males of each species are readily distinguished by genitalic features but often require clearing of the abdomen in potassium hydroxide. Some of these older dried specimens cleared poorly in potassium hydroxide, making it hard to see internal and some external structures of the genitalia. Females were not examined in this study, due to the difficulty of pairing them with males.

Figured specimens are identified by the notebook numbers of Dr Arturs Neboiss (prefix PT-) or the author (prefix CT-). Terminology generally follows that of Blahnik et al. (2009) and Holzenthal et al. (2007). However, authors have used several terms for the same structures, as outlined by Muñoz-Quesada and Holzenthal (2008, p. 8). Terms for genitalic parts are indicated on selected figures. Typically, setae or spines are illustrated only on the right side of the figure (as viewed) to enable clearer depiction of the underlying structures. Length/width (L/W) measurements generally mean maximum length divided by maximum width, although for the ventral process of segment IX, L/W generally means baso-distal length divided by basal width at junction with segment IX.

Table 1. Index and checklist of *Chimarra* from New Guinea (Papua New Guinea and the Indonesian Province of Papua/West Papua)

Indonesian Papua/West Papua Province	Papua New Guinea
<i>Chimarra abeli</i> Oláh, 2013 (Batanta Island)	<i>Chimarra absida</i> sp. nov.
<i>C. agasa</i> Oláh, 2013 (Batanta Island)	<i>C. aiyura</i> Korboot, 1965
<i>C. anoaclana</i> Malicky, 1978	<i>C. alicae</i> sp. nov.
<i>C. arfaka</i> Oláh, 2015	<i>C. antap</i> sp. nov.
<i>C. befela</i> Oláh, 2015	<i>C. bicornis</i> sp. nov.
<i>C. belsay</i> Malicky et al., 2014 (Biak Island)	<i>C. bicuspidus</i> sp. nov.
<i>C. biakensis</i> Malicky et al., 2014 (Biak Island)	<i>C. bifida</i> sp. nov.
<i>C. bifida</i> sp. nov.	<i>C. biramosa</i> Kimmins, 1957 (and New Britain, Bougainville Island, Solomon Islands),
<i>C. bintang</i> sp. nov.	<i>C. cavata</i> sp. nov.
<i>C. bobita</i> Oláh, 2012 (Batanta Island)	<i>C. clava</i> sp. nov.
<i>C. bogos</i> Oláh, 2013 (Batanta Island)	<i>C. cristata</i> sp. nov.
<i>C. botos</i> Oláh, 2015	<i>C. cyclopica</i> Kimmins, 1962
<i>C. cheesmanae</i> Kimmins, 1962	<i>C. damma</i> sp. nov.
<i>C. cyclopica</i> Kimmins, 1962	<i>C. denticulata</i> sp. nov.
<i>C. dialectica</i> Malicky et al., 2014 (Biak Island)	<i>C. ediana</i> sp. nov.
<i>C. eltuna</i> Oláh, 2015	<i>C. erecta</i> sp. nov.
<i>C. elvala</i> Oláh, 2013 (Batanta Island)	<i>C. erzekela</i> Oláh & Mey, 2013 (New Britain)
<i>C. erzek</i> Oláh, 2013 (Batanta Island)	<i>C. espelandae</i> sp. nov.

Indonesian Papua/West Papua Province	Papua New Guinea
<i>C. falcata</i> Kimmins, 1962	<i>C. formosa</i> Botosaneanu & de Vos, 2006
<i>C. fehera</i> Oláh, 2012 (Batanta Island)	<i>C. goroca</i> Sykora, 1967
<i>C. feholda</i> Oláh & Mey, 2013	<i>C. gressiti</i> Sykora, 1967
<i>C. felkora</i> Oláh, 2012 (Batanta Island)	<i>C. guentheri</i> Mey, 2006
<i>C. fogas</i> Oláh, 2013 (Batanta Island)	<i>C. harpes</i> sp. nov.
<i>C. furala</i> Oláh, 2015	<i>C. huonana</i> sp. nov.
<i>C. holda</i> Oláh, 2012 (Batanta Island)	<i>C. ismayi</i> sp. nov.
<i>C. horgoka</i> Oláh, 2012 (Batanta Island)	<i>C. johansoni</i> sp. nov.
<i>C. jari</i> sp. nov.	<i>C. karamui</i> sp. nov.
<i>C. kalija</i> Oláh, 2014 (Batanta Island)	<i>C. kewabi</i> sp. nov.
<i>C. kampa</i> Oláh, 2016 (Batanta Island)	<i>C. ketaga</i> Oláh & Mey, 2013 (New Britain)
<i>C. kanala</i> Oláh, 2012 (Batanta Island)	<i>C. kokodana</i> Kimmins, 1962 (and New Britain)
<i>C. kapcos</i> Oláh, 2016 (Batanta Island)	<i>C. kozela</i> Oláh & Mey, 2013 (New Britain)
<i>C. kebarana</i> sp. nov.	<i>C. kuka</i> sp. nov.
<i>C. kerka</i> Oláh, 2013 (Batanta Island)	<i>C. laensis</i> sp. nov.
<i>C. kesken</i> Oláh, 2015	<i>C. lalokiana</i> sp. nov.
<i>C. lekera</i> Oláh, 2015	<i>C. leopoldi</i> Jacquemart, 1981
<i>C. lerovida</i> Oláh, 2015	<i>C. lindyae</i> sp. nov.
<i>C. lud</i> Malicky, 2011	<i>C. longpela</i> Cartwright, 2001 (Bougainville Island)
<i>C. maai</i> sp. nov.	<i>C. lorengau</i> Malicky, 1994
<i>C. mrsale</i> Oláh, 2013 (Batanta Island)	<i>C. loriana</i> (Navás, 1933)
<i>C. oláhi</i> sp. nov.	<i>C. massana</i> Malicky, 1994 (Bismarck Archipelago.),
<i>C. nurga</i> Oláh, 2016 (Batanta Island)	<i>C. mendiana</i> sp. nov.
<i>C. papuana</i> Kimmins, 1962	<i>C. milneana</i> sp. nov.
<i>C. parza</i> Oláh, 2018 (Batanta Island)	<i>C. missim</i> sp. nov.
<i>C. porsen</i> Oláh, 2015	<i>C. morobensis</i> sp. nov.
<i>C. rokana</i> Oláh, 2016 (Batanta Island)	<i>C. mussaua</i> Malicky, 1994
<i>C. sabrona</i> Kimmins, 1962	<i>C. newguineana</i> sp. nov.
<i>C. sarkos</i> Oláh, 2013 (Batanta Island)	<i>C. panguna</i> Cartwright, 2001 (Bougainville Island)
<i>C. schmidi</i> Kimmins, 1962	<i>C. pertica</i> sp. nov.
<i>C. sepho</i> Malicky, 2011	<i>C. pindua</i> sp. nov.
<i>C. sinuosa</i> Kimmins, 1962	<i>C. pinga</i> Cartwright, 2001 (Bougainville Island)
<i>C. stella</i> sp. nov.	<i>C. projectura</i> sp. nov.
<i>C. sukula</i> Oláh, 2016 (Batanta Island)	<i>C. sappela</i> sp. nov.
<i>C. taga</i> Oláh, 2015	<i>C. sedlaceki</i> Sykora, 1967
<i>C. telcato</i> Malicky et al., 2014 (Biak Island)	<i>C. sepikana</i> sp. nov.
<i>C. toliana</i> sp. nov.	<i>C. simbuensis</i> sp. nov.
<i>C. tompa</i> Oláh, 2013 (Batanta Island)	<i>C. supia</i> sp. nov.
<i>C. tulok</i> Oláh, 2013 (Batanta Island)	<i>C. trigona</i> sp. nov.
<i>C. tuparna</i> Oláh, 2013 (Batanta Island)	<i>C. ukarumpana</i> sp. nov.
<i>C. ujika</i> Oláh, 2012 (Batanta Island)	<i>C. ulmeri</i> Kimmins, 1962
<i>C. vegsem</i> Oláh, 2013 (Batanta Island)	<i>C. unidentata</i> sp. nov.
<i>C. vekon</i> Oláh, 2013 (Batanta Island)	<i>C. verticas</i> sp. nov.
<i>C. waridora</i> Oláh, 2013 (Batanta Island)	<i>C. wara</i> sp. nov.
	<i>C. wauana</i> sp. nov.
	<i>C. xenillion</i> Neboiss, 1986
	<i>C. yaloma</i> Malicky, 1994 (Bismarck Archipelago.)
	<i>C. yulae</i> Cartwright, 2001 (Bougainville Island)

## Taxonomy

### *Chimarra* Stephens

*Type species. Chimarra marginata* by monotypy.

#### General features of males of New Guinea *Chimarra*

No formal key is provided for several reasons – primarily because many characters varied considerably between species (e.g. Rs sinuous or curved, thickened ranging to straight and not thickened basad of discoidal cell in forewing, ventral process on segment IX ranged from elongate and pole-like to absent). Because of the poor condition of many of the specimens (including the wings) and at times inadequate clearing of the genitalia, some features were difficult to discern with confidence.

Species are progressively separated throughout this paper on the basis of the L/W ratio of the ventral process on segment IX. Species were identified secondly by small differences in the shape of the inferior appendages (especially in lateral view) and the shape and position of the pair of lateral lobes on segment X.

The first feature used was the ventral process on segment IX. The relative length and the L/W ratio are used as a basic means of separating the New Guinea *Chimarra* species. The L/W ratio varies from 20 in *C. pertica* to 0 (absent) in many species. Having a similar ratio does not necessarily imply a relationship between the species. Only a few species (mostly from the *C. papuana* group) such as *C. pertica*, *C. guentheri* and *C. ukarumpuna* have an elongate and slender ventral process. Most species have a triangular or rounded keel or no obvious process. In the region, most Australian species have no obvious keel or only a small triangular one (Cartwright, 2002). Of the nearby Solomon Islands species, most have no obvious keel but *Chimarra talinensis* Johanson and Espeland has an elongate and robust ventral process (Johanson and Espeland, 2010), while in 24 species from Fiji (Johanson and Oláh, 2012) and three species from Vanuatu (Johanson et al., 2011), none has an obvious ventral process. Of the south-east Asian species, most have no obvious process or only a small keel; a few have a more pointed and elongate process, including *C. Chiangmaiensis* Chantaramongkol and Malicky, *C. khamuorum* Chantaramongkol and Malicky, *C. demeter* Malicky (Malicky, 2010). In Borneo, species in East Kalimantan (Indonesia) and Sabah (Malaysia) have elongate ventral processes, including *Chimarra devogeli* Blahnik et al., *C. drepane* Blahnik et al., *C. fuilianae* Blahnik et al. and *C. xiphosella* Blahnik et al. (Blahnik et al., 2009).

The second character used here for species separation is the shape of the inferior appendages (predominantly as viewed laterally). The worldwide range of variation in this structure is remarkable among *Chimarra* species. Although most New Guinea species have distinctively shaped inferior appendages, several exhibit slight variations on a pattern of otherwise almost uniformly elongate sub-triangular inferior appendages (in lateral view), making it difficult to distinguish them from each other using this character. Many of the species have inferior appendages with acute apices that are

inflexed or directed posteromesally and so are hidden in the lateral view; instead, these appendages may appear slightly truncate or abbreviated.

Other characteristics of interest include the form of the lateral lobes of segment X, the shape of preanal appendages on segment IX, the variety and shape of phallic structures, the presence or absence of obvious sensilla on the lateral processes of segment X, and variations in wing venation.

*General characteristics of the New Guinea Chimarra.* General body colour and wings brownish (unless faded with time in alcohol). Spur formula 1:4:4. Small to medium-sized adults. Forewing length range, males: 3.5–7 mm, more commonly 4–6 mm. Forewing often with Rs sinuous or curved, thickened (sometimes straight and not thickened) basad of discoidal cell, occasionally with small, clear, depressed window (fig. 63), forks 1, 2, 3 and 5 present; hind wing with forks 1 (usually), 2, 3 and 5 present (fig. 7). At least two species – *C. cyclopica* and *C. aliciae* – appear to have fork 1 absent on the hind wing, as originally noted by Kimmins for *C. cyclopica* (Kimmins 1962).

*Male.* Segment IX anterior margin ventral basally usually well-developed, often rounded or V-shaped; ventral process usually present, rarely very long (figs 1, 4), more usually short, keel-like (figs 70, 78, 132) or without obvious process (figs 155, 158). Preanal appendages usually short, rounded. Segment X with mesal lobe membranous, reduced and pair of more heavily sclerotised lateral lobes, mostly adpressed to phallus and without short hair-like sensilla discerned. Phallus generally tubular, phallobase expanded, rounded, usually with a pair of short, slender, straight or slightly curved spines included subapically, more rarely with only one or without obvious spines. Inferior appendages one-segmented, shape highly variable.

*Female.* Females have rarely been associated for any New Guinea species and were not examined during this study.

*Remarks.* No new material was seen for most of the previously described New Guinea species. During this study, new material was examined for the following nine species: *C. aiyura*, *C. biramosa*, *C. cyclopica*, *C. falcata*, *C. goroca*, *C. kokodana*, *C. sedlaceki*, *C. sinuosa* and *C. ulmeri*. These are re-described and significant parts are figured here.

A *papuana* species group comprising eight species – *C. agasa* Oláh, *C. bobita* Oláh, *C. kaliya* Oláh, *C. kozela* Oláh and Mey, *C. papuana* Kimmins, *C. porsen* Oláh, *C. tompa* Oláh and *C. tulok* Oláh – was recognised by Mey (2006) and further refined by Oláh (2014). In this study, four new species (*C. bintang* sp. nov., *C. mendiana* sp. nov., *C. milneana* sp. nov. and *C. ukarumpuna* sp. nov.) are aligned with the group, primarily on the basis of the unique characteristic of the long and curved filiform dorsoapical process on the inferior appendages, supported by the generally elongate ventral process on segment IX. Due to the poor condition of many of the dried BPBM specimens examined during this study, it is not possible to check and confirm all of the group characters, especially some characters discussed by Mey (2006) and Oláh (2014). No clear groupings were discerned among most of the New Guinea species; therefore, none of the species below are formally or informally grouped.

***Chimarra pertica* sp. nov.**

Figures 1–3

Holotype. Male (dried, pinned specimen CT-357 figured), PNG (south-east Central Province), Mamai Plantation, east of Port Glasgow, 150 m, about 10° 16' S, 149° 30' E, 27 January 1965, R. Straatman (BPBM).

**Diagnosis.** The males of *C. pertica*, *C. guentheri* Mey and *C. eltuna* Oláh can be separated from other New Guinea species by the very slender, elongate ventral process on segment IX, reaching to at least midlength of inferior appendages. *Chimarra pertica* differs from *C. guentheri* and *C. eltuna* in that the ventral process is not dilated distally in lateral view and the inferior appendages, in lateral view, have the dorsal margin curved (slightly convex), not straight near the midlength.

**Description.** General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.4 mm. Forewing with forks 1, 2, 3 and 5 present, Rs sinuous or curved, thickened basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, with angular extension ventrally (fig. 1); ventral process a very elongate, slender, rod-like projection, reaching almost length of inferior appendages (figs 1, 2), length about 20 times width in lateral view (fig. 1); preanal appendages small, rounded apically (figs 1, 3). Segment X with pair of lateral lobes (figs 1, 3), broad basally in lateral view, tapered in distal half, slender apically (fig. 1), in dorsal view slender with slightly rounded and dilated apices (fig. 3). Phallus with one slender internal spine subapically (figs 1, 3). Inferior appendages robust, apices acute, slightly inflexed (figs 2, 3), in ventral view sub-quadrate (fig. 2), in lateral view angled at about 45° to horizontal, length about 3 times width, upturned distally (fig. 1), length in ventral and dorsal views about twice width (figs 2, 3).

**Female.** Unknown.

**Etymology.** *Pertica* – Latin for long pole or rod (elongate ventral process on segment IX).

**Remarks.** *Chimarra pertica* is known only from the holotype male from the type locality in south-east PNG.

***Chimarra guentheri* Mey, 2006**

Figures 4–6

*Chimarra guentheri* Mey, 2006: 261, figs 1–4.

Type material (not seen). Holotype. Male (abdomen mounted as microscope preparation, genitalia slide Mey 22/06). (PNG, East Sepik Province) “D.N. Guinea T.40/Lager 7 26. V. 12/Kaiserin Augusta Fluss Expedition/Burgers S.G.” (MNHU).

**Material examined.** PNG. 1 male (dried, pinned specimen CT-398 figured), (south-east Oro Province), Mount Suckling, 500 m (about 9° 45' S, 148° 58' E), 11–16 July 1972, J.L. Gressitt (BPBM).

**Diagnosis.** The males of *C. guentheri* Mey and *C. eltuna* Oláh can be separated from other New Guinea species by the very elongate and distally slightly dilated ventral process on segment

IX. *Chimarra guentheri* is most similar to *C. eltuna*, especially in the length and shape of the ventral process on segment IX, but differs slightly in lateral view in that the ventral margin of the inferior appendages is less incised in the distal third, the elongate ventral process has a cluster of fine spinules on the ventral surface, and the phallus has one or two elongate, internal spines subapically.

**Description.** (Revised after Mey, 2006). General body colour and wings light brown to brown. Wings (Mey, 2006: fig. 4) similar to *C. ukarumpuna* (fig. 7). Length of forewing: male 4.1–4.4 mm. Forewing with forks 1, 2, 3 and 5 present, Rs sinuous or curved, thickened basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present (Mey, 2006).

**Male.** Segment IX anterior margin in lateral view, with angular extension ventrally (fig. 4); ventral process slender, rod-like, very elongate, reaching almost length of inferior appendages, dilated in apical third, with fine spinules along ventral margin (figs 4, 5), length in lateral view about 6.5 times maximum width (fig. 4), preanal appendages small and rounded apically (figs 4, 6). Segment X with pair of lateral lobes, short, hair-like sensilla visible in basal half (fig. 6; Mey, 2006: figs 1–2), lobes, in lateral view, broad basally, tapered slightly in distal half (fig. 4), in dorsal view, slender, with apices slightly out-turned (fig. 6). Phallus with one or two (two shown in Mey 2006: figs 1–2) slender internal spines subapically (figs 4, 6). Inferior appendages robust, somewhat semicircular, with acute, posteromesally directed apices (figs 4–6), in lateral view angled at about 45° to horizontal, length about 2.8 times width, broadest near middle, ventral margin rounded, dorsal margin straight, narrowed in basal third, tapered distally (fig. 4), appearing truncate in Mey (2006: fig. 1) due to obscured, inflexed apices, in ventral and dorsal views, broadest in basal two thirds, with outer margin rounded and apices acute and inflexed, nearly meeting dorsal to phallus (fig. 5; Mey, 2006: figs 2–3).

**Female.** Unknown.

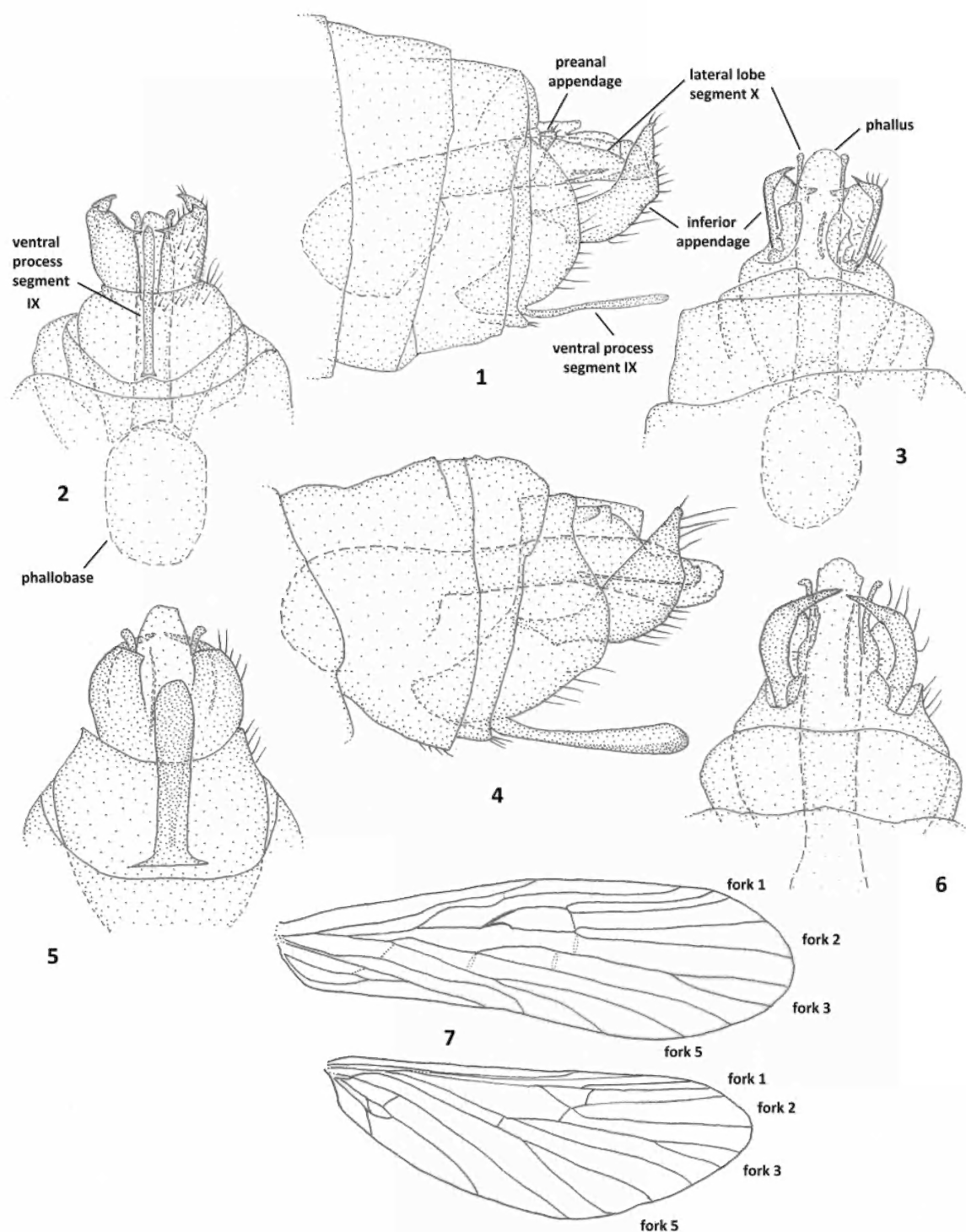
**Remarks.** *Chimarra guentheri* is known from the holotype male and one other male from two localities in the East Sepik and Oro provinces of PNG. These localities are about 1000 km apart (in a straight line). New figures have been drawn to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Chimarra* genital structures from Mey's (2006) original description.

***Chimarra ukarumpuna* sp. nov.**

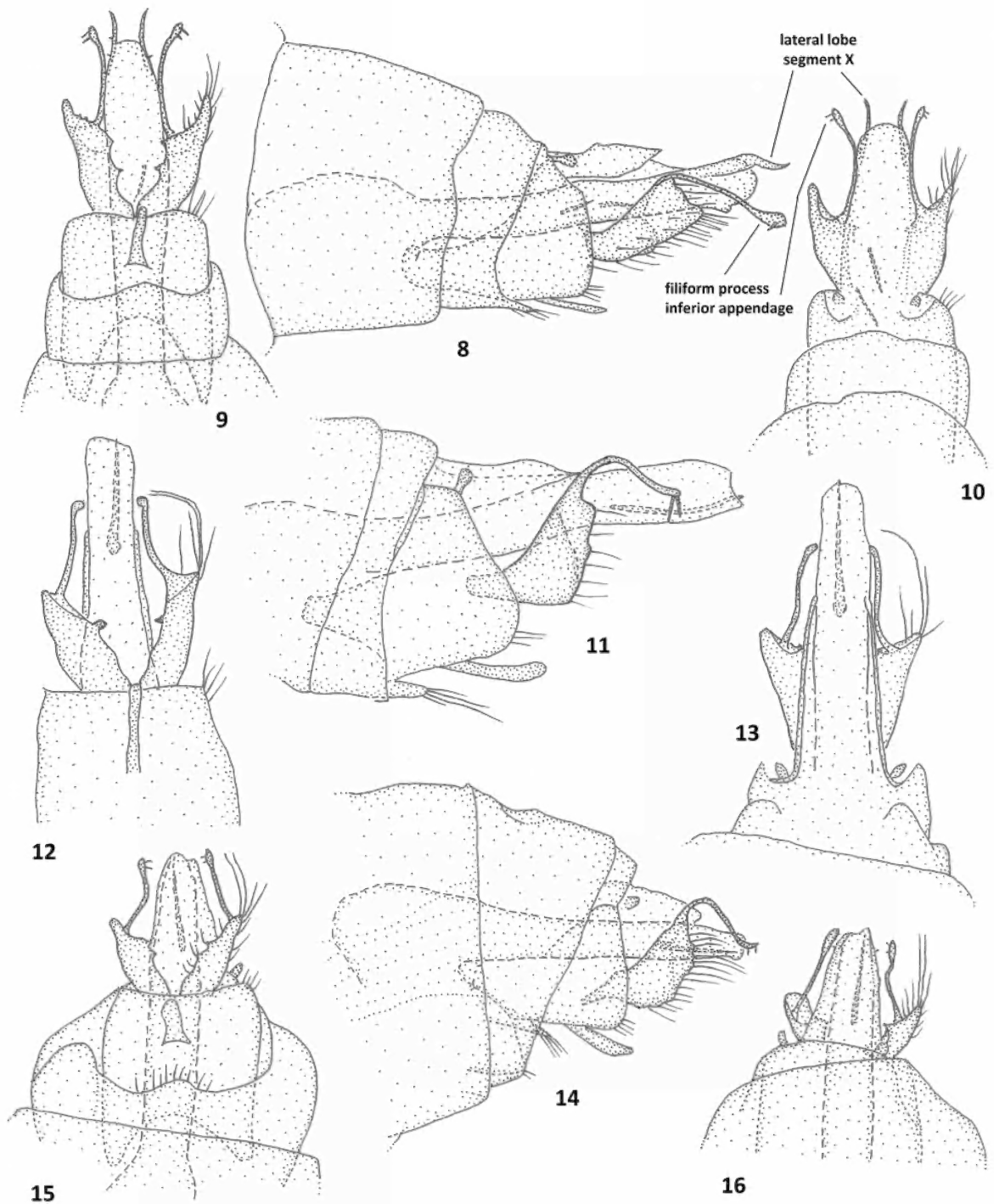
Figures 7–10

Holotype. Male (specimen in alcohol, CT-344 figured), PNG (East Highlands District/Province), Ram Creek, Ukarumpa, about 6° 07' S, 145° 24' E, 23 June 1986, A. Wells (NMV, T).

**Diagnosis.** The male of *C. ukarumpuna* aligns with the *C. papuana* group (after Mey, 2006) and is most similar to *C. papuana* Kimmins and *C. tulok* Oláh in that in lateral view, the inferior appendages are sub-rectangular with the distal margin truncate. *C. ukarumpuna* and *C. tulok* can be separated



Figures 1–7. *Chimarra* spp.; 1–3, *Chimarra pertica* sp. nov., male, holotype, genitalia; 1, lateral; 2, ventral; 3, dorsal. 4–6, *Chimarra guentheri* Mey, male, genitalia; 4, lateral; 5, ventral; 6, dorsal. 7, *Chimarra ukarumpuna* sp. nov., male, holotype; 7, wings.



Figures 8–16. *Chimarra* spp.; 8–10, *Chimarra ukarumpana* sp. nov., male, holotype, genitalia; 8, lateral; 9, ventral; 10, dorsal. 11–13, *Chimarra mendiana* sp. nov., male, holotype, genitalia; 11, lateral; 12, ventral; 13, dorsal. 14–16, *Chimarra bintang* sp. nov., male, holotype, genitalia; 14, lateral; 15, ventral; 16, dorsal.

from *C. papuana* by small differences in the genitalia, including inferior appendages in lateral view are slightly more tapered basally and not as regularly rectangular as for *C. papuana* and have a more elongate dorso-apical projection. In *C. ukarumpana*, the apices of the lateral lobes of segment X are pointed distally and in *C. tulok* dorso-basally.

**Description.** General body colour and wings pale (faded). Wings (fig. 7) similar to those of *C. papuana* (Kimmins, 1962: fig. 10). Length of forewing: male 4.8 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened basad of discoidal cell; hind wing with fork 1 absent, forks 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, greatly produced ventro-basally into a rounded extension (fig. 8); ventral process slender, elongate, rod-like, extending past distal margin of segment IX (figs 8, 9), in lateral view length about 10 times width (fig. 8); preanal appendages small, rounded apically (figs 8, 10), narrowed basally (fig. 8). Segment X with pair of slender lateral lobes, mostly adpressed to phallus, slightly downturned and curved outwards apically (figs 8, 10), with two small hairs subapically (fig. 9). Phallus with two slender spines included subapically (figs 8–10). Inferior appendages robust, sub-rectangular (figs 8, 9), in lateral view angled at about 30° to horizontal, length about 2.5 times width, slightly broader in apical half, truncate apically (fig. 8), with long and slender dorso-subapical projection, apex slightly dilated, bearing two short spines (figs 8–10), in ventral view with two small projections on mesal margin (fig. 9).

**Female.** Unknown.

**Etymology.** *Ukarumpana* – named after the type locality (Ukarumpa).

**Remarks.** *Chimarra ukarumpana* is known only from the holotype male from the type locality in central PNG.

### ***Chimarra mendiana* sp. nov.**

Figures 11–13

**Holotype.** Male (dried, pinned specimen, CT-403 figured), PNG (S Highlands Province), Mendi, 1660 m, lt tr, about 6° 10' S, 143° 40' E, 13 October 1958, T.C. Maa (BPBM).

**Diagnosis.** The male of *C. mendiana* aligns with the *C. papuana* group (after Mey, 2006) and is most similar to *C. bintang*, sp. nov., *C. papuana* Kimmins, *C. bobita* Oláh, *C. kalija* Oláh and *C. ukarumpana*, sp. nov., because the elongate ventral process on segment IX exceeds the distal margin of segment IX. *Chimarra mendiana* differs from the other species, including *C. papuana*, because the apex of the dorso-apical projection of the inferior appendages is not dilated, as in *C. bobita* and *C. ukarumpana*; in lateral view, the distal margin of the inferior appendages is less severely truncate than in *C. papuana* and *C. ukarumpana*, and more sharply angled than in *C. bobita*, *C. kalija* and *C. bintang*.

**Description.** General body colour and wings fawn. Wings similar to those of *C. ukarumpana* (fig. 7). Length of forewing:

male 5.5 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened, basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, with strong angular extension ventrally (fig. 11); ventral process a slender, rod-like, elongate projection, extending past distal margin of segment IX (figs 11, 12), in lateral view, very slightly dilated distally, length about 6.2 times width (fig. 11); preanal appendages small, ovoid (figs 11, 13). Segment X with pair of slender lateral lobes (hard to see in this specimen), closely adpressed to phallus (figs 12, 13), no sensilla visible (fig. 13). Phallus with one slender, elongate spine included near apex (figs 11–13). Inferior appendages robust, in lateral view, angled dorsally at about 75° to horizontal, proximally sub-rectangular, length about 1.6 times width, broadest in basal half, tapered basally and slightly distally (fig. 11), with long and slender dorso-subapical projection, with very slender apex with two short spines (figs 11–13), in ventral view with one small projection on inner margin (fig. 12).

**Female.** Unknown.

**Etymology.** *Mendiana* – named for the type locality (Mendi).

**Remarks.** The single male specimen of *Chimarra mendiana* is known from central PNG.

### ***Chimarra bintang* sp. nov.**

Figures 14–16

**Holotype.** Male (dried, pinned specimen, CT-339 figured), Indonesia, Papua Province (= West Papua), Star Range, Sibil, 1300 m, about 5° 00' S, 141° 00' E, 26 June 1959, Museum Leiden, Netherlands, New Guinea exp. (RMNH).

**Material examined.** Indonesia. 1 male (dried, pinned specimen, CT-386, damaged), Papua Province, Star Range, Sibil Valley, 1245 m, about 5° 00' S, 141° 00' E, 18 October–8 November 1961?, S. and L. Quate (BPBM).

**Diagnosis.** The male of *C. bintang* aligns with the *C. papuana* group (after Mey, 2006) and is most similar to *C. porsen* Oláh, *C. bobita* Oláh, *C. kalija* Oláh, *C. mendiana* and *C. ukarumpana* in having the elongate ventral process on segment IX reach past the distal margin of segment IX. *Chimarra bintang* is most similar to *C. porsen* and *C. mendiana* in that in lateral view, the apex of the dorso-apical projection of the inferior appendages is not dilated as in *C. bobita* and *C. ukarumpana*. *Chimarra bintang* differs from *C. porsen*, *C. kalija* and *C. ukarumpana* in having the ventral process on segment IX slightly tapered distally in lateral view and the inferior appendages gradually tapered in distal third, with ventral margin almost irregularly convex.

**Description.** General body colour and wings fawn (faded). Wings similar to those of *C. ukarumpana* (fig. 7). Length of forewing: male 4.6–5.7 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly to moderately sinuous or curved, slightly to moderately thickened basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, with rounded extension ventrally (fig. 14); ventral process slender, rod-like, elongate, extending almost to distal margin of segment IX (figs 14, 15), in lateral view slightly tapered distally, length about 4.5 times width (fig. 14); preanal appendages small, rounded apically (figs 14, 16). Segment X with pair of slender lateral lobes, adpressed laterally to phallus (figs 14–16), with one pair of sensilla visible subapically (fig. 16). Phallus with one slender, elongate, spine included subapically (figs 14–16). Inferior appendages robust, in lateral view angled dorsally at about 45° to horizontal, sub-semicircular, length about 2.2 times width, broadest in middle, tapered gradually basally and apically, ventral margin irregularly convex (fig. 14), with long and slender dorso-subapical projection, with very slightly dilated apex bearing two short spines (figs 14–16), in ventral view with two small projections on mesal margin (fig. 15).

**Female.** Unknown.

**Etymology.** *Bintang* – Indonesian for star (locality Star Range).

**Remarks.** Only the two males (one damaged) of *Chimarra bintang* are known from the type locality in Papua.

### ***Chimarra wauana* sp. nov.**

Figures 17–19

**Holotype.** Male (dried, pinned specimen, CT-367 figured), PNG, Morobe Province, Wau, 1700 m, about 7° 20' S, 146° 43' E, Malaise Trap, 23 July 1965, J. and M. Sedlacek (BPBM).

**Paratypes.** PNG. 1 male (dried, pinned specimen, CT-368), same locality and collector as holotype, 30 July 1965 (BPBM); 1 male (dried, pinned specimen, CT-406), same locality and collector as holotype, 1750 m, 16 August 1965 (BPBM); 1 male (PT-1240), same locality and collector, 1750 m, 27 September 1965 (BPBM).

**Material examined:** PNG. 1 male (CT-402), Central Province, Mount Albert Edward, 2820 m, about 8° 20' S, 147° 30' E, Malaise Trap, 10 November 1965, J. Sedlacek (BPBM).

**Diagnosis.** The males of *C. wauana* can be separated from all other New Guinea species by the dorso-ventrally flattened ventral process on segment IX and, in lateral view, sub-parallelgram shaped inferior appendages, with both dorsal and ventral margins straight and parallel for much of their length.

**Description.** General body colour and wings light brown to brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.0–5.4 mm. Forewing with forks 1, 2, 3 and 5 present, Rs straight or slightly sinuous or curved, not thickened basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, with strong angular extension ventrally and minute extension dorsally (fig. 17); ventral process a dorso-ventrally flattened projection, width in ventral view about 6 times width in lateral view (figs 17, 18), in lateral view, length about 11 times width (fig. 17), preanal appendages relatively large, truncate apically. Segment X lateral lobes laterad of phallus, laterally compressed or plate-like, with sensilla not discerned (figs 17, 19), in lateral view robust, downturned slightly apically to broadly rounded apices (fig. 17),

in dorsal and ventral views appear slender and slightly out turned apically (figs 18, 19). Phallus with two slender spines included subapically (figs 17–19). Inferior appendages robust, with apices acute, posteromesally directed (figs 17–19), in lateral view angled dorsally at about 45° to horizontal, sub-parallelgram, dorsal and ventral margins mostly parallel, length about 3 times width, tapered gradually in basal quarter (fig. 17), in ventral and dorsal views, with curved lateral margins, tapered distally (figs 18, 19).

**Female.** Unknown.

**Etymology.** *Wauana* – named for type locality (Wau).

**Remarks.** Five male specimens of *Chimarra wauana* are known from two higher altitude localities in the Morobe and Central Provinces of PNG; these sites are separated by about 150 km.

### ***Chimarra jari* sp. nov.**

Figures 20–22

**Holotype.** Male (dried, pinned specimen, CT-338 figured), Indonesia, Papua Province (West Papua), Star Range, 1500 m, Sibil, 30 June 1959, Museum Leiden, Netherlands, New Guinea exp. (BPBM).

**Diagnosis.** The male of *C. jari* can be separated from all other New Guinea species by the subapical, mesal finger-like projection on the inferior appendages, and more basally situated, slender ventral process on segment XI.

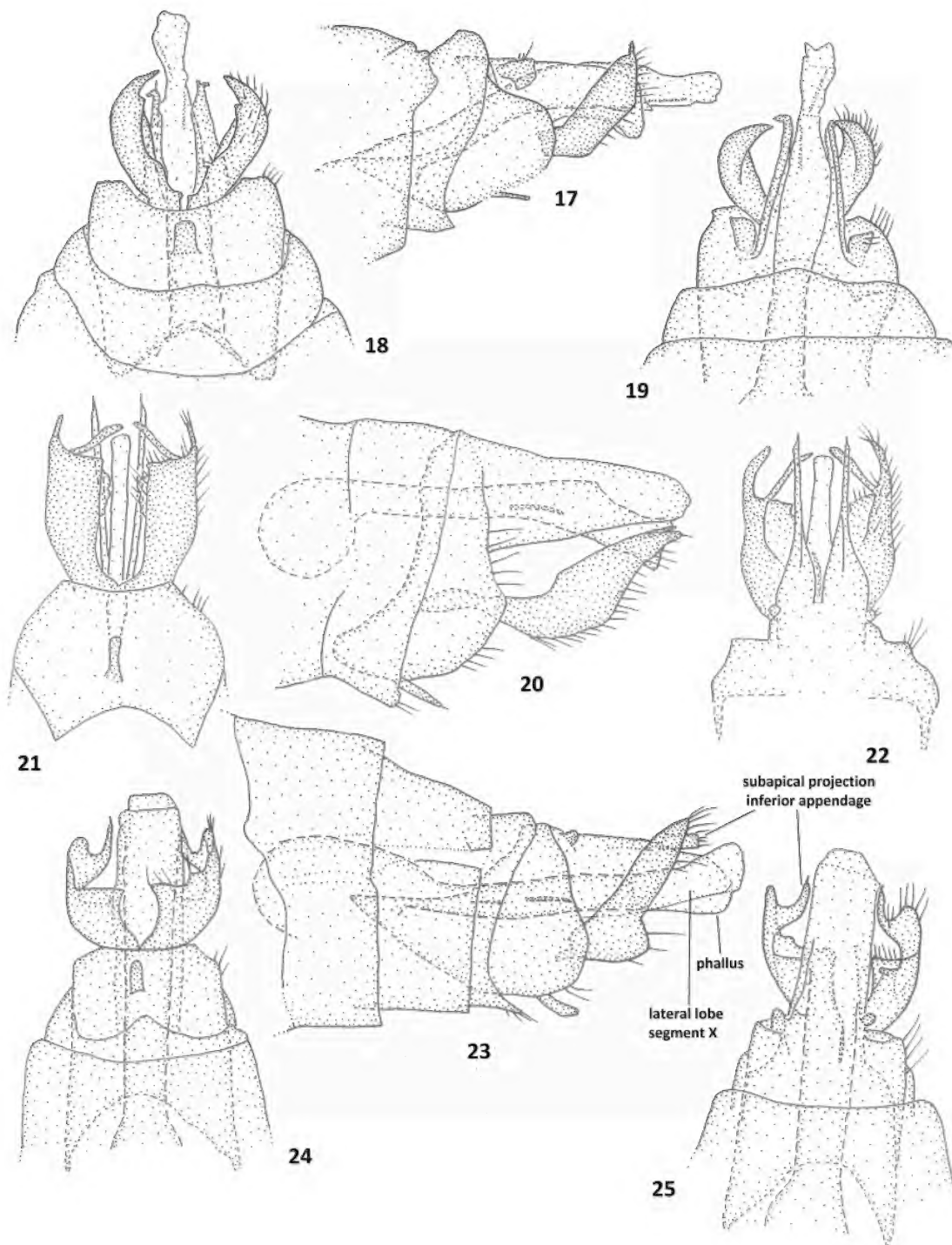
**Description.** General body colour and wings pale (faded). Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.1 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, strongly thickened basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, with rounded extension ventrally (fig. 20); ventral process a short, slender projection, situated towards base of segment (figs 20, 21), in lateral view length about 5.3 times width, slightly tapered distally (fig. 22), in ventral view slightly rounded apically (fig. 21), preanal appendages small, rounded apically (fig. 22). Segment X with pair of plate-like, laterally flattened lateral lobes, sensilla not obvious (figs 20–22), in lateral view lobes appear robust, broadly rounded apically (fig. 20), in dorsal view expanded basally, appear very slender distally, apically acute (fig. 22). Phallus slightly laterally compressed with one slender spine included at about midlength (figs 20, 22). Inferior appendages robust, apices acute (figs 20–22), in lateral view angled at about 30° to horizontal, length about 3 times width, broadest near middle, narrowed basally, tapered in apical third (fig. 20), in ventral and dorsal views broad with lateral and mesal margins in distal half almost parallel, subapically with slender, finger-like mesal process (figs 21, 22).

**Female.** Unknown.

**Etymology.** *Jari* – Indonesian for finger.

**Remarks.** *Chimarra jari* is known only from the holotype male from eastern Papua.



Figures 17–25. *Chimarra* spp.; 17–19, *Chimarra wauana* sp. nov., male, holotype, genitalia; 17, lateral; 18, ventral; 19, dorsal. 20–22, *Chimarra jari* sp. nov., male, holotype, genitalia; 20, lateral; 21, ventral; 22, dorsal. 23–25, *Chimarra johansoni* sp. nov., male, holotype, genitalia; 23, lateral; 24, ventral; 25, dorsal.

***Chimarra johansonii* sp. nov.**

Figures 23–25

**Holotype.** Male (dried, pinned specimen, CT-407 figured), PNG, Morobe Province, Wau, 1400 m, about 7° 20' S, 146° 43' E, banana yeast bait, 18 February 1972, J.L. Gressitt (BPBM).

**Diagnosis.** The male of *C. johansonii* is similar to *C. toliana*, sp. nov. and *C. trigona*, sp. nov. in some genitalic characters, such as the shape of the inferior appendages and ventral process of segment IX, in lateral view. *C. johansonii* can be separated from the other two species by the presence of a subapical projection on the inferior appendages, which is truncate in lateral view and finger-like in ventral and dorsal views.

**Description.** General body colour and wings pale (faded). Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.6 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, strongly thickened, basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, with elongate angular extension ventrally (fig. 23), ventral process forming rod-like projection extending almost to distal margin of segment IX (figs 23, 24), in lateral view length about 4 times width, dilated slightly distally (fig. 23), in ventral view slightly rounded apically (fig. 24); preanal appendages small, rounded apically (figs 23, 25). Segment X lateral lobes hard to discern, laterad of phallus (figs 23, 25), in lateral view, robust, apices rounded (fig. 23), in dorsal view, closely adpressed to phallus (fig. 25). Phallus with two slender spines included near middle (fig. 23). Inferior appendages robust, in lateral view, angled at about 60° to horizontal, length about 2.8 times width, broadest in basal half, narrowed strongly near one-third length, almost parallel sided in distal half, tapered gradually distally, subapical projection appears truncate (fig. 23), in ventral and dorsal views, broadest in basal half, mesal margin angular near middle, subapical projection digitiform, angled posteromesally (figs 24, 25).

**Female.** Unknown.

**Etymology.** Named for Kjell Arne Johanson for his contribution to the study of *Chimarra* in the south-west Pacific region.

**Remarks.** *Chimarra johansonii* is known only from the holotype male from the type locality in eastern PNG.

***Chimarra cristata* sp. nov.**

Figures 26–28

**Holotype.** Male (dried, pinned specimen, CT-353 figured), PNG, Eastern Highlands Province, Karimui, south of Goroka, 1000 m, about 6° 32' S, 144° 47' E, lt tr, 5 June 1961, J.L. Gressitt (BPBM).

**Paratype.** PNG. 1 male (dried, pinned specimen CT-372), Eastern Highlands Province, Kassam, 48 km east of Kainantu, 1350 m, about 6° 18' S, 145° 52' E, 7 November 1959, T.C. Maa (BPBM).

**Diagnosis.** The males of *C. cristata* can be separated from all other New Guinea species by the combination of having the inferior appendages with acute apices bearing a distinctive tuft of two or three elongate setae, and the ventral process on segment IX slightly angled near midlength, in lateral view.

**Description.** General body colour and wings fawn. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.2–4.3 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, thickened basad of discoidal cell; hind wing with forks 1?, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, with angular extension ventrally (fig. 26); ventral process in form of short slender projection with apex almost level with distal margin of segment IX (figs 26, 27), in lateral view length about 3 times width, slightly bent near middle (fig. 26), in ventral view slightly tapered distally (fig. 27); preanal appendages small, rounded apically (figs 26, 28). Segment X with sensilla not obvious, lateral lobes stout, tapered to pointed apices (figs 26, 28). Phallus with two slender spines embedded subapically (fig. 26, 27). Inferior appendages robust, tapered in distal quarter with acute, inflexed apices, bearing tuft of two or three elongate setae (figs 26–28), in lateral view, angled at about 45° to horizontal, length about 3.2 times width, almost parallel sided in basal three quarters (fig. 26), in ventral view, broadest in basal half, angled at about right angles basomesally (fig. 27).

**Female.** Unknown.

**Etymology.** *Cristata* – Latin for tufted or crested (hairs at tip of inferior appendages).

**Remarks.** *Chimarra cristata* is known from two male specimens from separate localities in the Eastern Highlands of PNG.

***Chimarra projectura* sp. nov.**

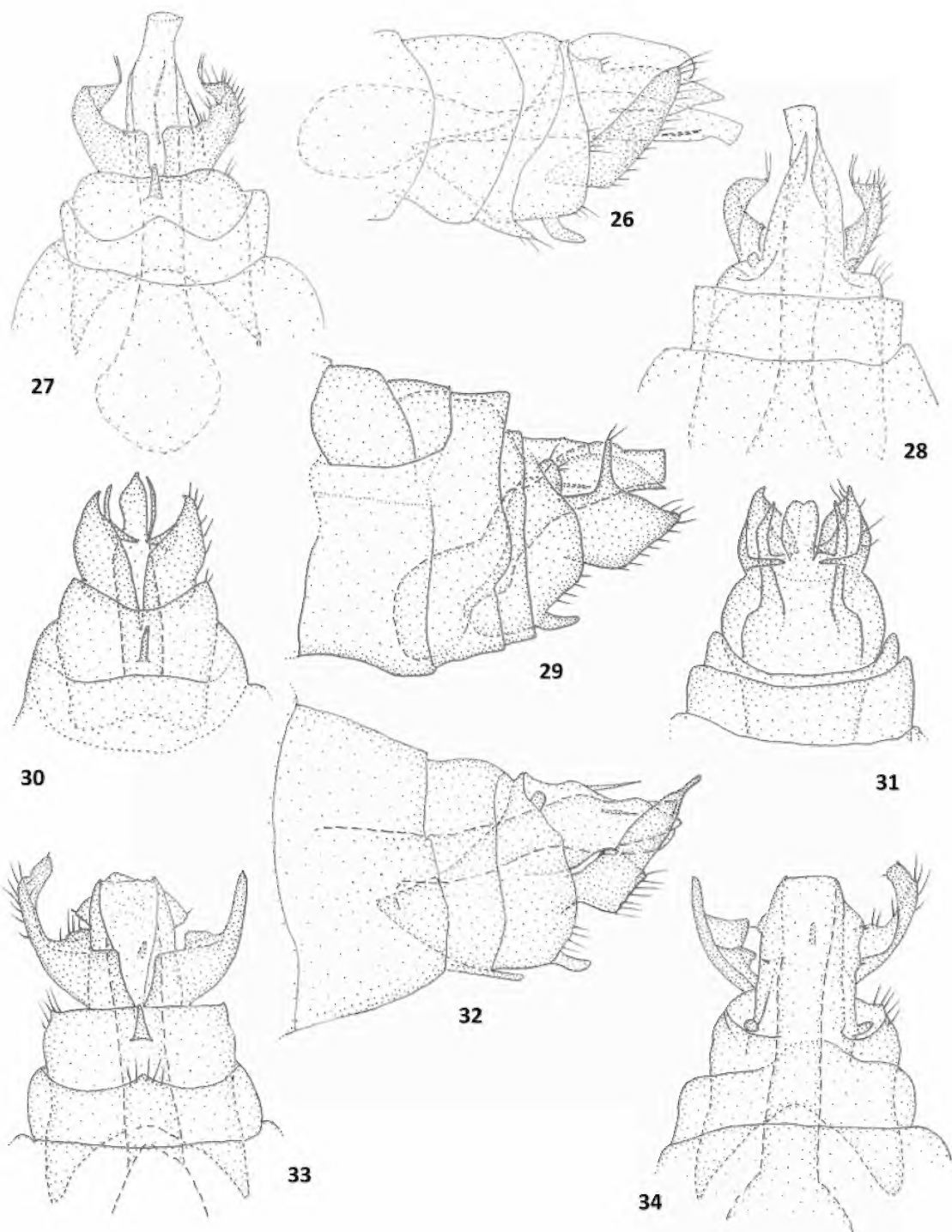
Figures 29–31

**Holotype.** Male (dried, pinned specimen CT-399 figured), PNG (south-east Oro Province), (Mau Island), Mount Suckling, 500 m, about 9° 42' S, 149° 02' E, at light, 11 July 1972, J.L. Gressitt (BPBM).

**Diagnosis.** The male of *C. projectura* can be separated from all other New Guinea species by the distinctive meso-dorsal projection on the inferior appendages.

**Description.** General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.3 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, with broadly rounded extension ventrally (fig. 29); ventral process a short slender projection distally tapering slightly, in length short of distal margin of segment IX (figs 29, 30), in lateral view length about 3 times width; preanal appendages rounded apically (fig. 29). Segment X laterally compressed, platelike, apices acute, with sensilla not obvious (fig. 31), in lateral view, lateral lobes robust, tapered distally (fig. 29), in dorsal view lateral lobes slender distally (fig. 31). Phallus with one slender spine included subapically (fig. 29). Inferior appendages robust, tapered distally with acute apices (figs 29–31), in lateral view aligned horizontally, length about equal to width, ventral margin convex, dorsal margin with finger-like dorsal projection (fig. 29), in ventral and dorsal views broadest in basal half, dorsal projection angled meso-dorsally (figs 30, 31).



Figures 26–34. *Chimarra* spp.; 26–28, *Chimarra cristata* sp. nov., male, holotype, genitalia; 26, lateral; 27, ventral; 28, dorsal. 29–31, *Chimarra projectura* sp. nov., male, holotype, genitalia; 29, lateral; 30, ventral; 31, dorsal. 32–34, *Chimarra toliana* sp. nov., male, holotype, genitalia; 32, lateral; 33, ventral; 34, dorsal.

*Female.* Unknown.

*Etymology.* *Projectura* – Latin for projection (inferior appendages).

*Remarks.* *Chimarra projectura* is known only from the type locality in south-east PNG.

### ***Chimarra toliana* sp. nov.**

Figures 32–34

*Holotype.* Male (dried, pinned specimen CT-383 figured), Indonesia, Papua Province, Swart Valley (renamed Toli Valley?), (1500 m?), about 3° 38' S, 138° 30' E, It tr, 10 November 1958, J.L. Gressitt (BPBM).

*Diagnosis.* The male of *C. toliana* is most similar to *C. trigona* but can be separated from it and all other New Guinea species by the distinctive dorso-ventrally constricted apices on the inferior appendages, appearing in lateral view as a slender point but robust and truncate in ventral and dorsal views.

*Description.* General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.2 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, slightly thickened basad of discoidal cell.

*Male.* Segment IX anterior margin in lateral view, with angular extension ventrally (fig. 32); ventral process a short projection with apex about level with distal margin of segment IX, slightly tapered distally (figs 32, 33), in lateral view length about 2.7 times width (fig. 32), in ventral view triangular, distally acute (fig. 33); preanal appendages rounded apically (figs 32, 33). Segment X (damaged?) with a slender dorsal projection (fig. 32), lateral lobes platelike, adpressed to phallus, tapered to acute apices, two pairs of ?conical sensilla obvious (fig. 34), in lateral view lateral lobes robust (fig. 32), in dorsal view lateral lobes slender (fig. 34). Phallus with one slender spine embedded subapically (fig. 32). Inferior appendages robust, tapered distally, apex dorso-ventrally flattened at least on left appendage, in lateral view appears slender, in ventral and dorsal views sub-truncate (right appendage slightly damaged; figs 32–34), in lateral view, angled at about 45° to horizontal, sub-triangular, length about 3 times width, ventral margin angled in basal half, dorsal margin almost straight (fig. 32), in ventral and dorsal views broadest in basal half, angled at about right angles basomesally, with irregularity or tooth on mesal margin (figs 33, 34).

*Female.* Unknown.

*Etymology.* *Toliana* – named after the type locality (Toli Valley, formerly the Swart Valley).

*Remarks.* *Chimarra toliana* is known only from the type locality in Indonesian Papua. The genitalia (inferior appendage only) of the holotype male is slightly damaged on the right side.

### ***Chimarra trigona* sp. nov.**

Figures 35–37

*Holotype.* Male (dried, pinned specimen CT-354 figured), PNG, Morobe Province, Wau, 1200 m, about 7° 20' S, 146° 43' E, Malaise Trap, 17 August 1961, J. Sedlacek (BPBM).

*Diagnosis.* The male of *C. trigona* is most similar to *C. toliana* but can be separated from it and all other New Guinea species by the shape of the inferior appendages in lateral view, with the basal half robustly triangular and distal half relatively slender.

*Description.* *Male.* General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.3 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened basad of discoidal cell.

*Male.* Segment IX anterior margin in lateral view, with angular extension ventrally (fig. 35); ventral process short with apex extending past distal margin of segment IX (figs 35, 36), in lateral view length about 2.5 times width, apex acute (fig. 35), in ventral view triangular, pointed distally (fig. 40); preanal appendages rounded apically (figs 35, 36). Segment X mesal lobe indistinct, lateral lobes elongate with sensilla not obvious (fig. 37), in lateral view lateral lobes robust, tapered slightly towards apices (fig. 35), in dorsal view slender, dilated slightly in distal half with rounded apices (fig. 37). Phallus with two slender spines embedded subapically (fig. 35). Inferior appendages broadest basally, narrowed near middle, tapered distally, apices acute, directed posteromesally (figs 35–37), in lateral view angled at about 45° to horizontal, broadly triangular in basal half, slender in distal half (fig. 35), in ventral view angled at about right angles basomesally (fig. 36).

*Female.* Unknown.

*Etymology.* *Trigona* – Latin for triangular, having three corners (inferior appendages).

*Remarks.* *Chimarra trigona* is known only from the type locality in north-east PNG.

### ***Chimarra harpes* sp. nov.**

Figures 38–40

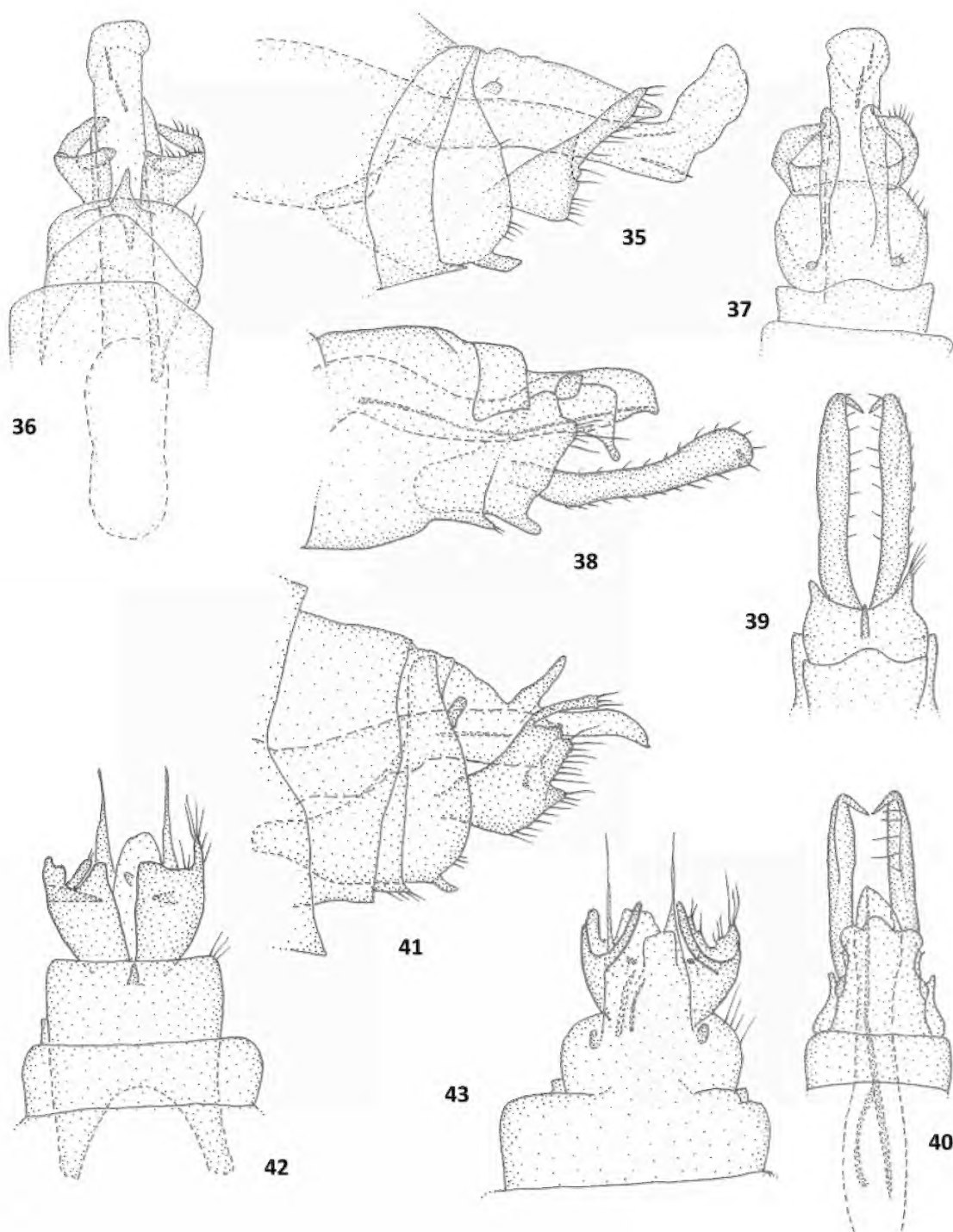
*Holotype.* Male (specimen in alcohol, CT-336 figured), PNG, (?Central Province), locality and collector (A. Wells?) unknown (NMV, T-22453).

*Paratypes.* PNG. 2 males, collected with holotype (NMV).

*Diagnosis.* The males of *C. harpes* are most similar to *C. clava* and *C. longpela* Cartwright in the elongate shape of the inferior appendages but can be separated from those and all other New Guinea species by small differences in the inferior appendages, which in lateral view, are elongate and slightly dilated in the distal third, with a meso-apical projection and a distinctive elongate embedded phallic spine, not found in any other New Guinea *Chimarra* species.

*Description.* General body colour and wings pale (faded). Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 3.8–4.1 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened basad of discoidal cell.

*Male.* Segment IX anterior margin in lateral view, with rounded extension ventrally (fig. 38), ventral process in lateral view short, apically close to length of distal margin of



Figures 35–43. *Chimarra* spp.; 35–37, *Chimarra trigona* sp. nov., male, holotype, genitalia; 35, lateral; 36, ventral; 37, dorsal. 38–40, *Chimarra harpes* sp. nov., male, holotype, genitalia; 38, lateral; 39, ventral; 40, dorsal. 41–43, *Chimarra milneana* sp. nov., male, holotype, genitalia; 41, lateral; 42, ventral; 43, dorsal.

segment IX (figs 38, 39), length about 2.5 times width, slightly rounded distally (fig. 38), in ventral view narrowly triangular, distally acute (fig. 39); preanal appendages in dorsal view appear rounded (fig. 40), in lateral view appear sub-quadrangle (fig. 38). Segment X with one pair of sensilla visible (fig. 40), in lateral view lateral lobes robust, apically truncate, with short ventrally directed digitiform process at apico-ventral angle (fig. 38), in dorsal view lateral lobes difficult to discern, aligned laterally to phallus, apices rounded (fig. 40). Phallus with a slender, elongate embedded spine (figs 38, 40) and a second shorter spine basally (fig. 40). Inferior appendages elongate, slightly laterally flattened, sword-shaped (figs 38–40), in lateral view aligned nearly horizontally, length about 5 times width, appears club-like, slightly dilated in distal third, apices broadly rounded (fig. 38), in ventral and dorsal views with slender meso-apical projection (figs 39, 40).

*Female.* Unknown.

*Etymology.* *Harpes* – Latin for curved sword or scimitar (shape of inferior appendages in lateral view).

*Remarks.* *Chimarra harpes* is known from three males from one (unknown?) locality in eastern PNG.

#### ***Chimarra milneana* sp. nov.**

Figures 41–43

Holotype. Male (specimen in alcohol, CT-390 figured), PNG, Milne Bay Province, Milne Bay, about 10° 22' S, 150° 30' E, 14–23 February 1969, J. and M. Sedlacek (BPBM).

*Diagnosis.* The male of *C. milneana* aligns vaguely with the *C. papuana* group in possessing a filiform dorsoapical process on the inferior appendages but lacking an elongate ventral process on segment IX (after Mey, 2006) and is most similar to *C. bobita* Oláh, 2012. *Chimarra milneana* can be separated from *C. bobita* and other members of the group by the relatively short ventral process on segment IX and the sharply and complexly angled ventral margin of the inferior appendages.

*Description.* General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.3 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened, basad of discoidal cell.

*Male.* Segment IX anterior margin in lateral view, with narrowly rounded extension ventrally (fig. 41); ventral process short, tapered and acute distally (fig. 42), almost reaching distal margin of segment IX (figs 41, 42), in lateral view length about 2.5 times width (fig. 41); preanal appendages sub-rectangular with rounded apices (figs 41, 43). Segment X mesal lobe with dorsally directed, dorso-ventrally flattened projection, lateral lobes elongate, laterally compressed distally, with sensilla not discerned (fig. 43), in lateral view lateral lobes appear robust, with slightly downturned apices (fig. 41), in dorsal view lateral lobes tapered near middle, appear very slender in distal half (fig. 43). Phallus with two slender spines included subapically

(fig. 43). Inferior appendages robust in basal two thirds, narrowed in distal third, with dorso-subapical projection bearing three hairs apically, directed posteromesally (figs 41–43), in lateral view inferior appendages angled at about 45° to horizontal, length about 1.6 times width, ventral margin angled at about 90° both near distal two thirds and distally (fig. 41), in ventral view mesal margin angled at about 90° distally, with projection on the mesal surface (fig. 42).

*Female.* Unknown.

*Etymology.* *Milneana* – named after the type locality (Milne Bay).

*Remarks.* *Chimarra milneana* is known only from the type locality in south-east PNG.

#### ***Chimarra kuka* sp. nov.**

Figures 44–46

Holotype. Male (dried, pinned specimen CT-375 figured), PNG, Eastern Highlands Province, Kassam, 1350 m, about 6° 18' S, 146° 15' E, sweeping, 28 October 1959, T.C. Maa (BPBM).

*Diagnosis.* The male of *C. kuka* can be separated from all other New Guinea species in having distinctive slender, pincer-like inferior appendages. Superficially, the inferior appendages are similar to the pincer-like ones of *C. atnia* Malicky and Chantaramongkol from Peninsula Malaysia and Thailand; however, other features of the genitalia such as the shape of the lateral lobes of segment X and ventral processes on segments VIII and IX and phallic structure differ slightly.

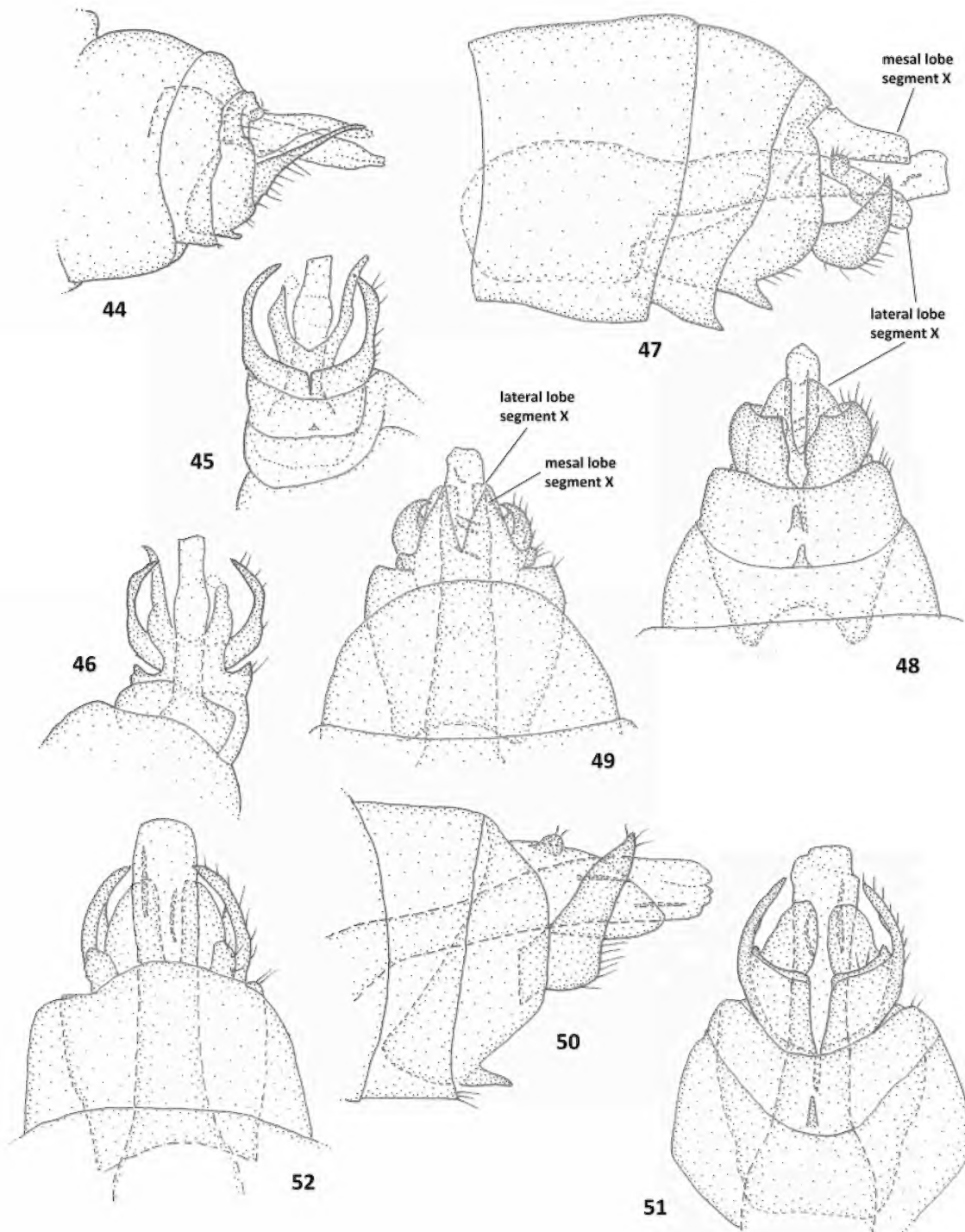
*Description.* General body colour and wings fawn. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.4 mm. Forewing with forks 1, 2, 3 and 5 present, Rs sinuous or curved, thickened, basad of discoidal cell.

*Male.* Segment IX anterior margin in lateral view, without extension ventrally (fig. 44); ventral process short, sharply triangular in ventral view, arising close to base, apex well short of distal margin of segment IX (figs 44, 45), in lateral view length about 2.3 times width (fig. 44); preanal appendages sub-ovate, rounded apically (fig. 44). Segment X lateral lobes slightly laterally compressed (left lobe damaged distally), robust in basal half tapered slightly distally to narrowly rounded apices, sensilla not discerned (figs 44–46), in dorsal and ventral views lobes with apices slightly out turned (figs 45, 46). Phallus without any discernible spines. Inferior appendages broadest basally, tapered and slightly dorso-ventrally flattened distally, with apices acute, directed slightly posteromesally (figs 44–46), in lateral view angled at about 45° to horizontal, length about 4 times width at base, very slender in distal half (fig. 44).

*Female.* Unknown.

*Etymology.* *Kuka* – New Guinea Pidgin for pincers (inferior appendages).

*Remarks.* *Chimarra kuka* is known only from the holotype male from central PNG.



Figures 44–52. *Chimarra* spp.; 44–46, *Chimarra kuka* sp. nov., male, holotype, genitalia; 44, lateral; 45, ventral; 46, dorsal. 47–49, *Chimarra absida* sp. nov., male, holotype, genitalia; 47, lateral; 48, ventral; 49, dorsal. 50–52, *Chimarra oldhi* sp. nov., male, holotype, genitalia; 50, lateral; 51, ventral; 52, dorsal.

***Chimarra absida* sp. nov.**

Figures 47–49

Holotype. Male (specimen in alcohol, CT-346 figured), PNG, West Highlands Province, Trauna River, Bayer River Sanctuary, 1160 m, about 5° 30' S, 144° 10' E, UV light, 16 June 1986, A. Wells (NMV, T-22456).

Paratype. 1 Male (CT-370), PNG, north-east, Lae, Singuawa R., 30 m, about 6° 45' S, 147° 10' E, 3 April 1966, O.R. Wilkes (BPBM).

**Diagnosis.** The males of *C. absida* are most similar to *C. holda* Oláh in having the ventral margin of the inferior appendages short, curved and convex in lateral view, and a series of small embedded spines positioned across the phallus subapically. *Chimarra absida* can be separated from *C. holda* Oláh by the more robust inferior appendages with right angle present basomesally, as viewed ventrally. *Chimarra absida* is also superficially similar to the northern Australian species *C. stclairae* Cartwright but lacks the two small processes on the mid-mesal margin of the inferior appendages.

**Description.** General body colour and wings light brown. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.4 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, slightly thickened basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anteroventral margin in lateral view greatly produced and rounded (fig. 47); ventral process short, triangular with acute apex, basal to posterior margin of segment IX (figs 47, 48), length about twice width (fig. 47); preanal appendages rounded apically (figs 47, 48). Segment X mesal lobes robust, appear truncate in lateral view and triangular in dorsal view (figs 47, 49), lateral lobes robust, with sensilla not discerned (fig. 49), in lateral view, lateral lobes dilated and downturned slightly in distal half, apices rounded (fig. 47), in ventral and dorsal views lateral lobes tapered slightly distally to attenuate apices (figs 48, 49). Phallus with four short, slender spines included subapically and at about two-thirds length, angled across phallus. Inferior appendages short, stout, with acute apices directed posteromesally (figs 47, 49), in lateral view angled at about 30° to horizontal, length about 2.4 times width, broadest near middle, tapered slightly basally and distally with dorsally directed apices, dorsal margin slightly concave, ventral margin strongly convex (fig. 47), in ventral view appears truncate, disto-mesal margin with 90° angle (fig. 48).

**Female.** Unknown.

**Etymology.** *Absida* – Latin for arc, segment of circle (ventral margin of inferior appendages).

**Remarks.** *Chimarra absida* is known from two male specimens from separate localities in central and eastern PNG.

***Chimarra olahi* sp. nov.**

Figures 50–52

Holotype. Male (dried, pinned specimen CT-341 figured), Indonesia, Papua Province (West Papua), Star Range, 1300 m, about 5° 00' S, 141° 00' E, 26 June 1959, Museum Leiden, Netherlands, New Guinea exp. (RMNH).

**Diagnosis.** The male of *C. olahi* can be separated from all other New Guinea species by the combination of a distinctive flange on the posteroventral margin of the inferior appendages and a ventral process on segment X, which is short and acute apically. *Chimarra simbuensis* sp. nov. (fig. 153) also has a strong flange, but on the mesal margin of the inferior appendages, and the ventral process on segment IX is a very weak keel.

**Description.** General body colour and wings fawn (faded). Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.5 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, with rounded, weak extension ventrally (fig. 50); ventral process short, triangular, apically acute, inserted at about half length of ventral margin of segment IX (figs 50, 51), in lateral view length about twice width (fig. 50); preanal appendages ovoid, rounded apically (figs 50, 51). Segment X with sensilla not discerned (fig. 52), lateral lobes robust, platelike, laterad of and ventral to phallus, slightly tapered distally to rounded apices (figs 50–52). Phallus with two slender spines included subapically (figs 50–52). Inferior appendages robust, broadest in basal half, tapered slightly distally, acute apices directed slightly posteromesally, in lateral view angled at about 60° to horizontal, sub-triangular, length about 2.6 times maximum width, ventral margin angled obtusely in basal half, dorsal margin almost straight (fig. 50), in ventral view slender in distal half, mesal margin angled at about 90° near middle, narrow flange on posteroventral margin (fig. 51).

**Female.** Unknown.

**Etymology.** Named for János Oláh for his contribution to the study of *Chimarra* from Fiji and Batanta Island (Indonesia).

**Remarks.** *Chimarra olahi* is known only from the holotype male from Papua.

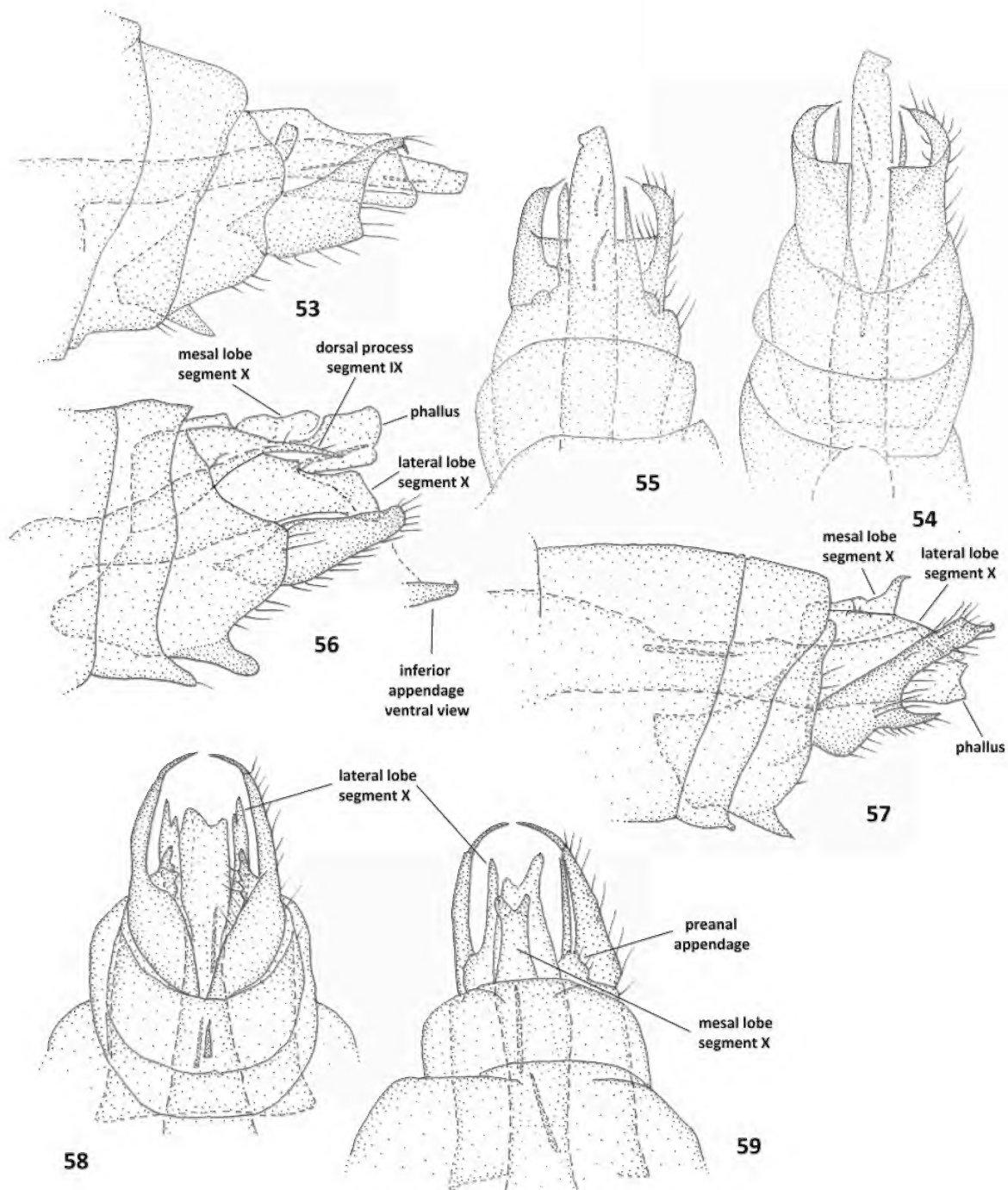
***Chimarra ediana* sp. nov.**

Figures 53–55

Holotype. Male (dried specimen, CT-374 figured), PNG, Morobe Province, Edia(-e) Creek, (15 km south-west of) Wau, 200 m, about 7° 19' S, 146° 41' E, Malaise Trap, 5–11 October 1961, J. Sedlacek (BPBM).

**Diagnosis.** The male of *C. ediana* can be separated from all other New Guinea species, including *C. wara* and *C. gressetti* Sykora, by the combination of small differences in the shape of the inferior appendages, which are broad basally, tapered strongly in distal half and in lateral view have the ventral margin concave in the distal half and a 90° angle basal to the concavity.

**Description.** General body colour and wings fawn. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.8 mm. Forewing with forks 1, 2, 3 and 5 present, Rs sinuous or curved, thickened, basad of discoidal cell.



Figures 53–59. *Chimarra* spp.; 53–55, *Chimarra ediana* sp. nov., male, holotype, genitalia; 53, lateral; 54, ventral; 55, dorsal. 56, *Chimarra cyclopica* Kimmins, male, genitalia; 56, lateral. 57–59, *Chimarra cavata* sp. nov., male, holotype, genitalia; 57, lateral; 58, ventral; 59, dorsal.

**Male.** Segment IX anterior margin in lateral view, with weak angular extension ventrally, ventral process short, triangular, apically acute, arising near base of segment IX, in lateral view length about twice width (fig. 53); preanal appendages rounded apically (figs 53, 54), in lateral view slightly ovoid (fig. 53). Segment X lateral lobes laterad of or straddle phallus, laterally compressed, with sensilla not discerned (fig. 55), in lateral view, lobes appear sub-rectangular (fig. 54), in dorsal view lateral lobes appear very slender in distal half (fig. 55). Phallus with two slender spines embedded subapically (figs 53–55). Inferior appendages robust, broadest in basal half, narrowed forming a 90° angle near two-thirds length, tapered strongly in distal third, apical spine directed mesally (figs 53, 54), in lateral view angled at about 30° to horizontal, length about 2.4 times width, ventral margin with slight concavity in distal half, dorsal margin almost straight (fig. 53), in ventral view mesal margin angled at about 90° near mid length (fig. 54).

**Female.** Unknown.

**Etymology.** *Ediana* – named for the type locality (Edia Creek).

**Remarks.** *Chimarra ediana* is known only from the holotype male north-east PNG.

### ***Chimarra cyclopica* Kimmins, 1962**

Figure 56

*Chimarra cyclopica* Kimmins, 1962: figs 8, 9.—Neboiss, 1986: 108.

Type material not seen. Holotype. Male. Indonesia, Papua Province (formerly Dutch New Guinea), West Papua, Mount Cyclops, 3500 ft (1067 m), about 2° 31' S, 140° 31' E, March 1936, L.E. Cheeseman (BMNH).

**Material examined.** 2 males (specimen in alcohol, CT-334 partly figured), PNG, Western Highlands Province, Pengi Creek, Bayer River Sanctuary, about 5° 19' S, 144° 11' E, lt tr, 16 June 1986, A. Wells (NMV); 1 male (CT-376), Indonesia, (West Papua) Ifar (Cyclops Mountains), 300–600 m, about 2° 34' S, 140° 31' E, 22 June 1959, J.L. Gressitt (BPBM).

**Diagnosis.** The males of *C. cyclopica* can be separated from all other New Guinea species by the combination of the unique pair of elongate dorsal processes on the ninth segment and inferior appendages which are tapered distally, with slightly hooked, in-turned acute apices, in ventral view.

**Description** (revised after Kimmins, 1962). General body colour and wings brownish. Wings (Kimmins, 1962: fig. 8) similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.0–4.4 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened basad of discoidal cell, hind wing with fork 1 apparently absent, forks 2, 3 and 5 present (Kimmins, 1962: fig. 8).

**Male.** Segment IX anterior margin rounded ventro-basally (fig. 56); ventral process a short, digiform projection, slightly basal to distal margin of segment IX (fig. 56; Kimmins, 1962: fig. 9D), in lateral view length about 1.5 times width, with rounded apex (fig. 56), in ventral view narrowly triangular, apically acute (fig. 9D; Kimmins, 1962), preanal appendages not discerned, but with pair of elongate dorsal processes (Kimmins,

1962: fig. 9A, C), in lateral view dorsal processes slender distally, apices acute (fig. 56). Segment X with sensilla not obvious, lateral lobes robust, plate-like, laterad of and ventral to phallus (fig. 56; Kimmins, 1962: figs 9A, C). Phallus with one slender spine included subapically (fig. 56; Kimmins, 1962: fig. 9B). Inferior appendages robust, broadest in basal half, slightly tapered distally (fig. 56; Kimmins, 1962: fig. 9A, D), in lateral view angled at about 15° to horizontal, length about 2.5 times width, apices rounded (fig. 56) or slightly acute (Kimmins, 1962: fig. 9A), in ventral view apices meso-distally directed, acute (fig. 56; Kimmins, 1962: fig. 9D).

**Female.** Unknown.

**Remarks.** *Chimarra cyclopica* is known from six male specimens from three disjunct localities on the island of New Guinea, from both northern Papua and central PNG. A new figure has been drawn to allow direct comparison and to accompany the description that is revised in light of new interpretations of *Chimarra* genitalic structures from Kimmins' (1962) original description. The illustration shown here (fig. 56) differs slightly from that of the type specimen shown in Kimmins (1962; fig. 9A) in the shape of the posterior margin of segment IX and relative length and shape of tergum X, but I am confident that they are conspecific, particularly with the distinctive pair of elongate dorsal processes on the ninth segment.

### ***Chimarra cavata* sp. nov.**

Figures 57–59

Holotype. Male (dried, pinned specimen CT-355 figured), PNG, Central Province, Mamai Plantation, east of Port Glasgow, 150 m, about 10° 16' S, 149° 30' E, 27 January 1965, R. Straatman (BPBM).

Paratypes. PNG, 2 males (CT-394, CT-393 damaged), collected with holotype (BPBM).

**Diagnosis.** The males of *C. cavata* can be separated from all other New Guinea species by the combination of the inferior appendages with a prominent projection on the mid-ventral margin, which in lateral view, partly forms a concavity in the distal half, plus slender and incurved apices which are pincer-like in ventral view.

**Description.** General body colour and wings fawn to light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 3.5–4.2 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately to strongly sinuous or curved, thickened basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, with broad, angular extension ventrally (fig. 57), ventral process short, triangular, apically acute, situated basal to distal margin of segment IX (figs 57, 58), in lateral view length about 1.5–1.6 times width (fig. 57); preanal appendages rounded apically. Segment X in lateral view mesal lobe partly produced dorsally (fig. 57), narrowly bifid in dorsal view (fig. 59), lateral lobes appear laterally compressed with sensilla not discerned (figs 57, 59), in lateral view lateral lobes robust, hard to distinguish from phallus (fig. 57), in ventral and dorsal views appear very slender in distal half, apices acute (fig. 58). Phallus with two slender spines included near middle. Inferior appendages

robust, broadest in basal half, narrowed strongly near midlength, acute apices directed posteromesally (figs 57–59), in lateral view angled at about 45° to horizontal, length about 3.3 times width, ventral margin with a prominent pointed projection on the mid-ventral margin that partly forms a concavity in distal half, dorsal margin mostly straight (fig. 57), in ventral view projection of ventral margin setose and irregular on its mesal margin, apices slender, nearly touching (fig. 58).

*Female.* Unknown.

*Etymology.* *Cavata* – Latin for hollow, hollowed out (inferior appendages).

*Remarks.* *Chimarra cavata* is known only from the type locality in south-east PNG.

### ***Chimarra clava* sp. nov.**

Figures 60–62

*Holotype.* Male (dried, pinned specimen CT-361 figured), PNG, Morobe Province, Wau, Hospital Creek, 1230 m, about 7° 20' S, 146° 43' E, 16 June 1965, J. Sedlacek (BPBM).

*Paratypes.* PNG, 1 male, Morobe Province, Wau, 1200 m, about 7° 20' S, 146° 43' E, Malaise Trap, 8 July 1961, J. and M. Sedlacek (BPBM); 1 male (PT-1241), same locality and collector, 1 December 1965 (BPBM); 1 male (PT-1266), same locality, 14 February 1963, J. Sedlacek (BPBM); 1 male, Morobe Province, Wau, Big Wau Creek, 1300 m, about 7° 20' S, 146° 43' E, Malaise Trap, November 1965, J. Sedlacek (BPBM).

*Diagnosis.* The males of *C. clava* are similar to those of *C. harpes* sp. nov. and *C. longpela* Cartwright, the three species all having inferior appendages elongate and club-like in lateral view, a feature that separates them from all other New Guinea species. *Chimarra clava* differs from *C. harpes* in that the inferior appendages are not slightly dilated in the distal third and lack the meso-apical projection and distinctive elongate embedded phallic spine. *Chimarra clava* can be distinguished from *C. longpela* in that the inferior appendages are less elongate and the ventral process on the IX segment is obvious.

*Description.* General body colour and wings light brown to brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.9–5.1 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly to moderately sinuous or curved, slightly thickened basad of discoidal cell.

*Male.* Segment VIII ventral process dorso-ventrally flattened, apex acute (figs 60, 61), in lateral view slender (fig. 60), in ventral view broadbased, triangular (fig. 61). Segment IX anterior margin in lateral view, with acute angular extension ventrally (fig. 60), ventral process short with rounded apex, nearly level with distal margin of segment IX (figs 60, 61), in lateral view length about 1.5–1.6 times width (fig. 60), in ventral view partly obscured by segment VIII ventral process (fig. 61); preanal appendages in lateral view, appear digiform with narrowly rounded apices (fig. 60), in dorsal view, appear sub-triangular (fig. 66). Segment X lateral lobes laterad of phallus and hard to discern, with sensilla not discerned (figs 60, 62). Phallus with two slender spines embedded subapically (figs 60–62). Inferior appendages robust, elongate, apices incurved

(figs 60, 61), in lateral view angled at about 30° to horizontal, length about 5.5 times width, ventral and dorsal margins mostly straight and parallel, apices appear broadly rounded (fig. 60), in ventral and dorsal views mesal and lateral margins mostly straight and parallel in basal two thirds, tapered in distal third with apices acute (figs 61, 62).

*Female.* Unknown.

*Etymology.* *Clava* – Latin for club, cudgel (inferior appendages).

*Remarks.* *Chimarra clava* is known from five males collected from the Wau district in eastern PNG.

### ***Chimarra newguineana* sp. nov.**

Figures 63–65

*Holotype.* Male (dried, pinned specimen CT-397 figured), PNG, Western Highlands Province, Mount Hagen, 1600–1700 m (about 5° 52' S, 144° 13' E), September 1971, N.H. Krauss (BPBM).

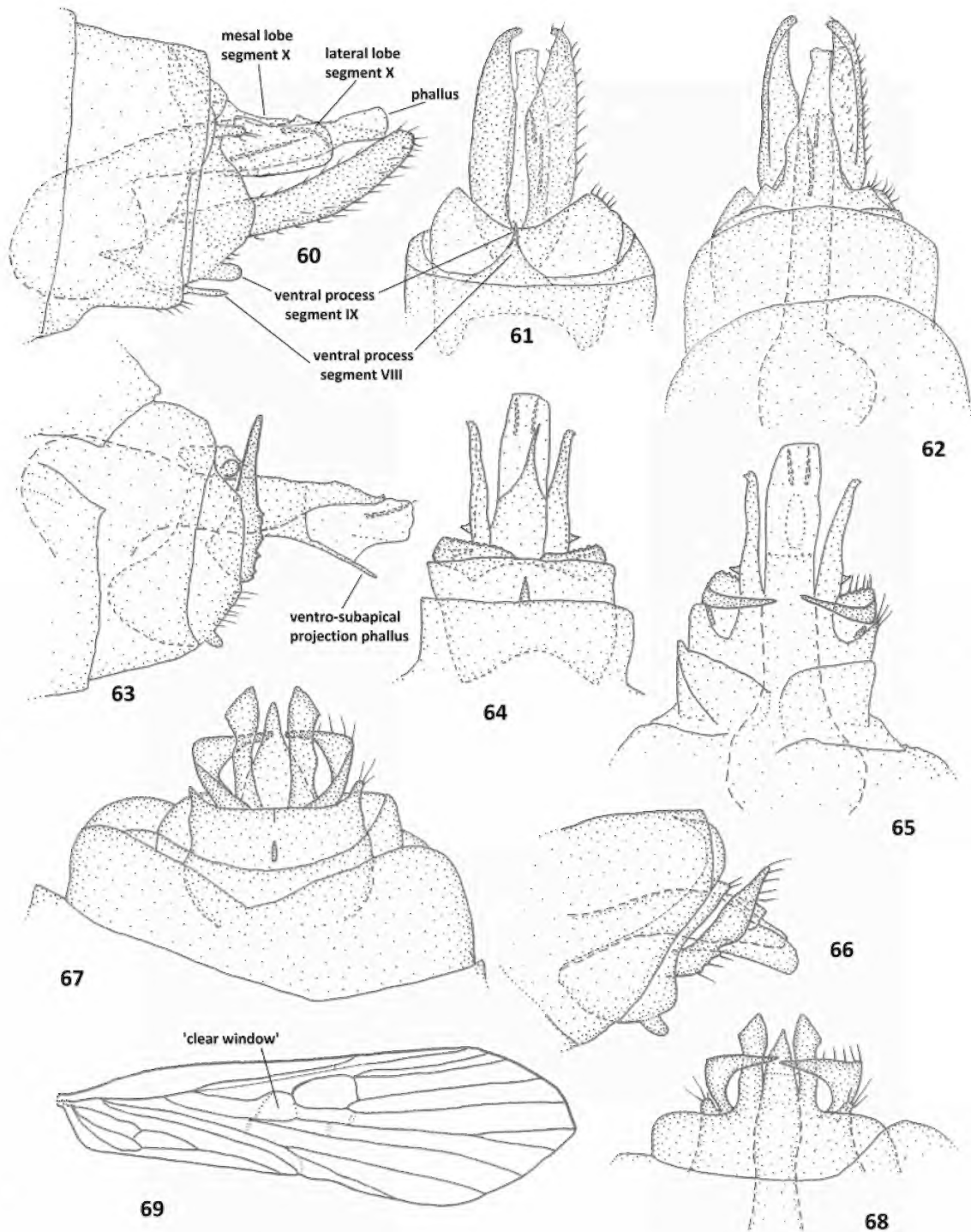
*Paratype.* Male (in alcohol, specimen CT-714), PNG, Eastern Highlands Province, Ukarumpa, Bai River (about 6° 34' S, 145° 88' E), 11 tr, 22 June 1986, A. Wells (NMV).

*Diagnosis.* The males of *C. newguineana* are similar to those of *C. aiyura* Korboot and *C. sedlaceki* Sykora, but can be separated from these and all New Guinea species by the combination of the strongly developed spine-like apicoventral projection of the phallus (phallobase), the inferior appendages angled vertically, with irregularly serrate meso-ventral margin, and the lateral lobes of segment X with triangular flange in basal half and slightly out-turned apices.

*Description.* General body colour and wings fawn (faded) to light brown. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.2–5.8 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, slightly to moderately thickened basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

*Male.* Segment IX anterior margin in lateral view, with broad rounded extension ventrally and minute extension dorsally; ventral process short, basal to distal margin of segment IX (figs 63, 64), in lateral view keel shaped, length about 1.2–1.3 times width; preanal appendages slightly laterally flattened, appear rounded in lateral view (fig. 63), in dorsal view, appear narrowly ovate (fig. 65). Segment X lateral lobes slightly laterally flattened with sensilla not discerned, broadest in basal half, tapered in distal half (figs 63, 65), in ventral and dorsal views lateral lobes with triangular flange in basal half (possibly with sensilla), apices appear slightly out turned (figs 64, 65). Phallus with two short, slender spines embedded subapically, with spine-like apicoventral projection (figs 63, 64). Inferior appendages slender, broadest in basal half with serrated ventromesal margin, tapered slightly in distal half, with acute apices directed dorsomesally (figs 63–65), in lateral view, angled at about 90° vertically, length about 3 times width at base, dorsal margin slightly concave in basal half and ventral margin slightly, irregularly convex in basal half and almost straight in distal half (fig. 63).

*Female.* Unknown.



Figures 60–69. *Chimarra* spp.; 60–62, *Chimarra clava* sp. nov., male, holotype, genitalia; 60, lateral; 61, ventral; 62, dorsal. 63–65, *Chimarra newguineana* sp. nov., male, holotype, genitalia; 63, lateral; 64, ventral; 65, dorsal. 66–69, *Chimarra pindua* sp. nov., male, holotype, 66–68, genitalia; 66, lateral; 67, ventral; 68, dorsal; 69, forewing.

**Etymology.** *Newguineana* – named for the locality (New Guinea Island).

**Remarks.** *Chimarra newguineana* is known from only two male specimens from the Western and Eastern Highlands of PNG.

### ***Chimarra pindua* sp. nov.**

Figures 66–69

**Holotype.** Male (dried, pinned specimen CT-366 figured), PNG: north-east, Morobe Province, Wau, 1250 m, about 7° 20' S, 146° 43' E, Malaise trap, 11 August 1965, J. and M. Sedlacek (BPBM).

**Diagnosis.** The male of *C. pindua*, together with some other species, have forewings with a small clear, depressed area or window basal to the discoidal cell; the New Guinea species *C. formosa* Botosaneanu and de Vos has a larger, pale hyaline area in both the forewings and the hind wings. The genitalia of *C. pindua* differs from *C. formosa* in that the inferior appendages are slender in *C. pindua*. It most closely resembles *C. sedlaceki* Sykora (fig. 70) in the shape of the inferior appendages in lateral view, but differs in that in lateral view the inferior appendages are slightly more robust, the phallus is slightly tapered apically and the lateral lobes of segment X are situated slightly more dorsally with respect to the phallus.

**Description.** General body colour and wings brownish. Wings similar to *C. ukarumpana* (fig. 7). Length of forewing: male 6.0 mm. Forewing with forks 1, 2, 3 and 5 present, small, clear window basad of discoidal cell, and Rs sinuous or curved, moderately thickened, basad of discoidal cell (fig. 69).

**Male.** Segment IX anterior margin in lateral view, anteroventrally rounded, ventral process short (figs 66, 67), in lateral view keel-like, length about 1.2–1.3 times width, rounded apically (fig. 66); preanal appendages small and rounded apically (figs 66, 68). Segment X with a pair of robust lateral lobes, sensilla not discerned (figs 66, 68), in lateral view lateral lobes rounded apically (fig. 66), in dorsal and ventral views, appear dilated or flanged subapically (figs 67, 68). Phallus slightly laterally compressed apically with no obvious included spines (figs 66–68), in lateral view appears rounded apically (fig. 66), in dorsal and ventral views appears tapered distally and acute apically (figs 67, 68). Inferior appendages tapered distally, with apices directed posteromesally (figs 66–68), nearly meeting dorsal to phallus (fig. 68), in lateral view, angled at about 60° to horizontal, length about 4.5 times width, broadest near middle, ventral margin irregular (fig. 66).

**Female.** Unknown.

**Etymology.** *Pindua* – New Guinea pidgin for window (small, clear window in forewings).

**Remarks.** *Chimarra pindua* is known only from the holotype male from eastern PNG.

### ***Chimarra sedlaceki* Sykora, 1967**

Figures 70–71

*Chimarra sedlaceki* Sykora, 1967: 588, fig. 3.—Neboiss, 1986: 106.

Type material not seen. Holotype. Male. North-east New Guinea (PNG), Wau, 1500 m (about 6° 20' S, 145° 53' E), at light, 10 October 1966, J. Illies (Bishop 7470).

**Material examined.** PNG. 1 male (dried, pinned specimen PT-1252 figured), Wau, Morobe District, 1200 m (7° 20' S, 146° 43' E), Malaise trap, 25 October 1965, J.M. Sedlacek (BPBM); 1 male (dried, pinned specimen CT-713), Wau, Morobe District, 1250 m (7° 20' S, 146° 43' E), Malaise trap, 20 March 1965, J.M. Sedlacek (BPBM); 2 males (CT-716; Western Highlands Province), Baiyer River Sanctuary, Trauna River, 5° 35' S, 144° 10' E, UV light, 17 June 1986, A. Wells (NMV); 4 males, (Western Highlands Province), Baiyer River Sanctuary, Trauna River, 1160 m, 5° 30' S, 144° 10' E, UV light, 16 June 1986, A. Wells (NMV).

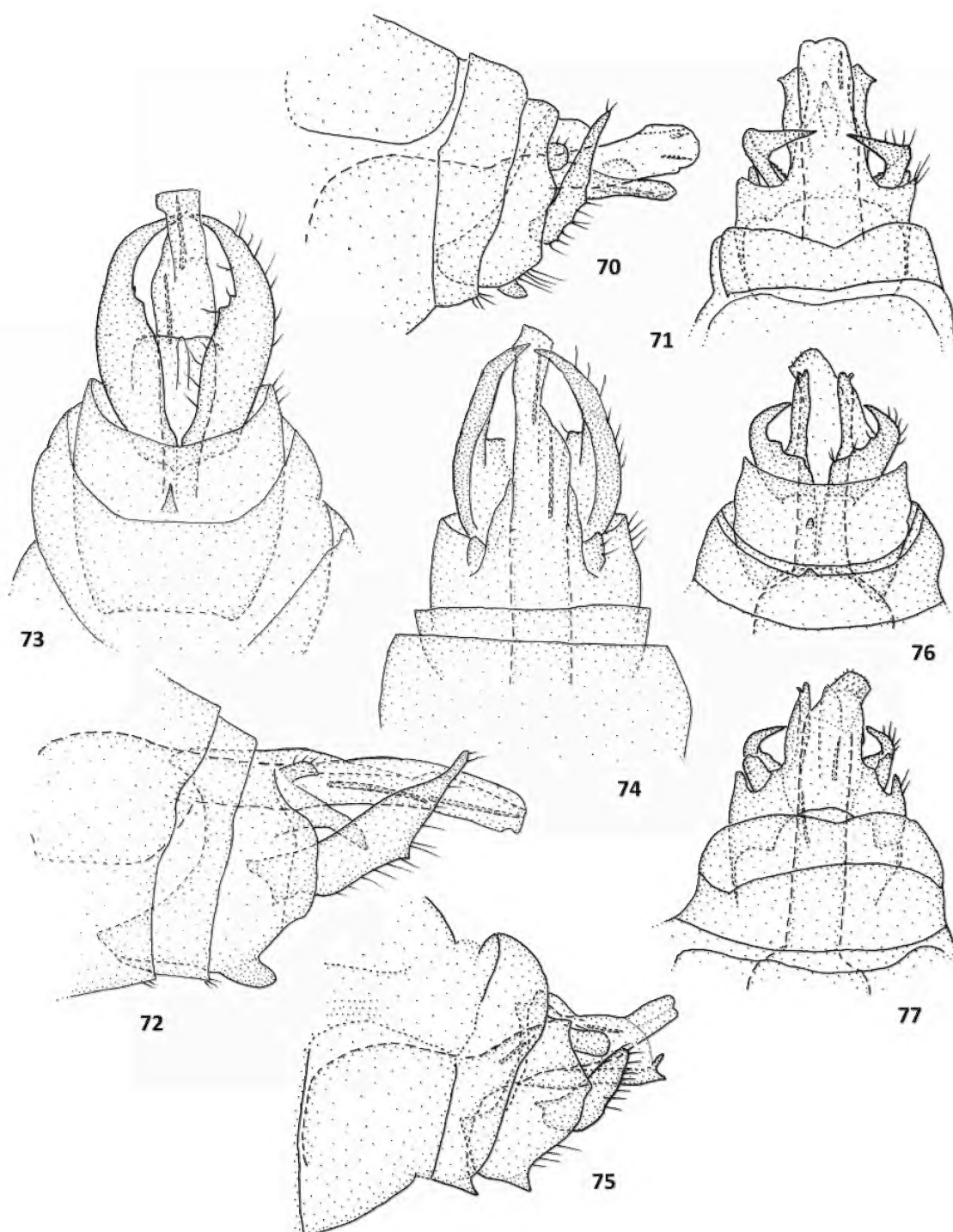
**Diagnosis.** The males of *C. sedlaceki* can be separated from all other New Guinea species, including *C. pindua*, *C. aiyyura* and *C. newguineana*, by the combination of the slender, almost perpendicular inferior appendages, the lateral lobes of segment X with the out turned subapical flange and the short, apically rounded ventral process on segment IX.

**Description** (revised after Sykora, 1967). General body colour and wings light brown to brownish. Wings (Sykora, 1967: fig. 3) similar to those of *C. ukarumpana* (fig. 7). Length of forewing: male 5.0–7 mm. Forewings with forks 1, 2, 3 and 5 present, Rs slightly to moderately sinuous or curved, moderately thickened basad of discoidal cell, and fork 1 with short footstalk (Sykora, 1967: fig. 3) or sessile (personal observation); hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, with rounded extension ventrally, ventral process short, basal to distal margin of segment IX, in lateral view, short, keel-shape, length about 1.2 times width (fig. 70; Sykora, 1967: fig. 3A), preanal appendages, relatively large, slightly laterally compressed (figs 70, 71), in lateral view appear rounded (fig. 70), in dorsal view appear elongate with rounded apices (fig. 71). Segment X lateral lobes situated slightly below phallus in distal third, slightly rounded apically, with sensilla not discerned (figs 70, 71), in lateral view, robust basally, narrowed in distal third (fig. 70), in dorsal view, with triangular flange subapically (fig. 71). Phallus with one or two short spines embedded subapically (figs 70, 71; Sykora, 1967: fig. 3D) and broadbased ventral projection (in lateral view, obscured by lateral lobe of segment X; fig. 70; Sykora, 1967: fig. 3A). Inferior appendages slender, broadest in basal third, narrowed slightly near middle, tapered slightly in distal half, with apices acute and directed posteromesally (figs 70, 71), in lateral view angled at about 75° to horizontal, length about 5 times width, dorsal margin almost straight and ventral margin slightly irregular in basal half, obtusely angled near middle and almost straight in distal half (fig. 70; Sykora, 1967: fig. 3A), in dorsal view, strongly angled near middle, mesal margin curved (fig. 71).

**Female.** Unknown.

**Remarks.** *Chimarra sedlaceki* is known from nine males from three localities in north-east PNG and two sites about 420 km west in the Western Highlands of PNG. New figures have been drawn to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Chimarra* genitalic structures from Sykora's (1967) original description.



Figures 70–77. *Chimarra* spp.; 70–71, *Chimarra sedlaceki* Sykora, male, genitalia; 70, lateral; 71, dorsal. 72–74, *Chimarra morobensis* sp. nov., male, holotype, genitalia; 72, lateral; 73, ventral; 74, dorsal. 75–77, *Chimarra damma* sp. nov., male, holotype, genitalia; 75, lateral; 76, ventral; 77, dorsal.

***Chimarra morobensis* sp. nov.**

Figures 72–74

**Holotype.** Male (dried, pinned specimen CT-359 figured), PNG, Morobe District, Wau, 1200 m, about 7° 20' S, 146° 43' E, Malaise Trap, 7 July 1961, J. Sedlacek (BPBM).

**Diagnosis.** The male of *C. morobensis* can be separated from all other New Guinea species, including *C. sappela*, by the combination of the robust pincer-like inferior appendages, with ventral margin angled obtusely near middle, tapered in distal half, with slender, meso-distally pointed digitiform apices, in lateral view, plus the ventrad directed ventral lobes of segment X, convergent ventrally supporting the phallus.

**Description.** General body colour and wings fawn. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.9 mm. Forewings with forks 1, 2, 3 and 5 present, Rs sinuous or curved, thickened, basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, with acute angular extension ventrally and small rounded extension dorsally (fig. 72), ventral process short, laterally compressed, basal to distal margin of segment IX (figs 72, 73), in lateral view appears rounded apically, length about 1.1 times width (fig. 72), in ventral view appears triangular, apically acute (fig. 73), preanal appendages, in lateral view appear sub-rectangular (fig. 72), in dorsal view appear sub-triangular (fig. 74). Segment X lateral lobes aligned laterad to phallus, hard to discern, with sensilla not discerned (figs 72, 74), in lateral view, ventral lobes slightly angled downwards, supporting phallus, apices appear acute (fig. 72). Phallus with two slender, relatively elongate spines embedded subapically (figs 72–74). Inferior appendages elongate, broadest in basal half, narrowed near midlength, tapered distally, apices acute, directed posteromesally (figs 72–74), in lateral view, angled at about 30° to horizontal, length about 4 times width, dorsal margin almost straight (fig. 72), in ventral view, lateral margins curved, mesal margin irregular near midlength, slightly concave in distal half (fig. 73).

**Female.** Unknown.

**Etymology.** *Morobensis* – Named after the type locality (Morobe Province).

**Remarks.** *Chimarra morobensis* is known from the type locality in north-east PNG.

***Chimarra damma* sp. nov.**

Figures 75–77

**Holotype.** Male (dried, pinned specimen CT-409 figured), PNG, New Britain, Gazelle Peninsula, Gaulim, 140 m, about 4° 44' S, 152° 08' E, Malaise Trap, 21–27 October 1962, J. Sedlacek (BPBM).

**Diagnosis.** The male of *C. damma* can be separated from all other New Guinea species, including the somewhat superficially similar *C. kebarana*, by the combination of the bifid apices on the plate-like lateral lobes of segment X and the short inferior appendages, with the ventral margin slightly curved in lateral view.

**Description.** General body colour and wings fawn or light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.6 mm. Forewings with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, thickened, basad to discoidal cell.

**Male.** Segment IX anterior margin in lateral view, with weak angular extension ventrally (fig. 75), ventral process short, basal to distal margin of segment IX (figs 75, 76), in lateral view triangular, length about same as width, preanal appendages, relatively large, in lateral view ovate with rounded apices (fig. 75). Segment X lateral lobes appear rod-like but are plate-like laterad of phallus, apices bifid, situated ventral to phallus, sensilla not discerned (figs 75–77). Phallus (with endotheca possibly not fully everted) with two slender spines included subapically and small field of short spines appear apically (figs 75–77). Inferior appendages short, broadest basally, tapered slightly distally, strongly incurved in about apical third, apices acute (figs 75, 76), in lateral view appear sub-ovate, angled at about 60° to horizontal, length about 3 times width, dorsal margin almost straight and ventral margin slightly convex (fig. 75), in ventral view obtusely angled on basomesal margin, mesal and lateral margins curved meso-distally (fig. 76).

**Female.** Unknown.

**Etymology.** *Damma* – Latin for gazelle or deer (type locality – Gazelle Peninsula).

**Remarks.** *Chimarra damma* is known from one locality on north-east New Britain Island, PNG.

***Chimarra aiyura* Korboot, 1965**

Figures 78, 79

*Chimarra aiyura* Korboot, 1965: 40, figs 1–4.—Neboiss, 1986a: 105.—Neboiss, 1987a: 132, figs 4–6.

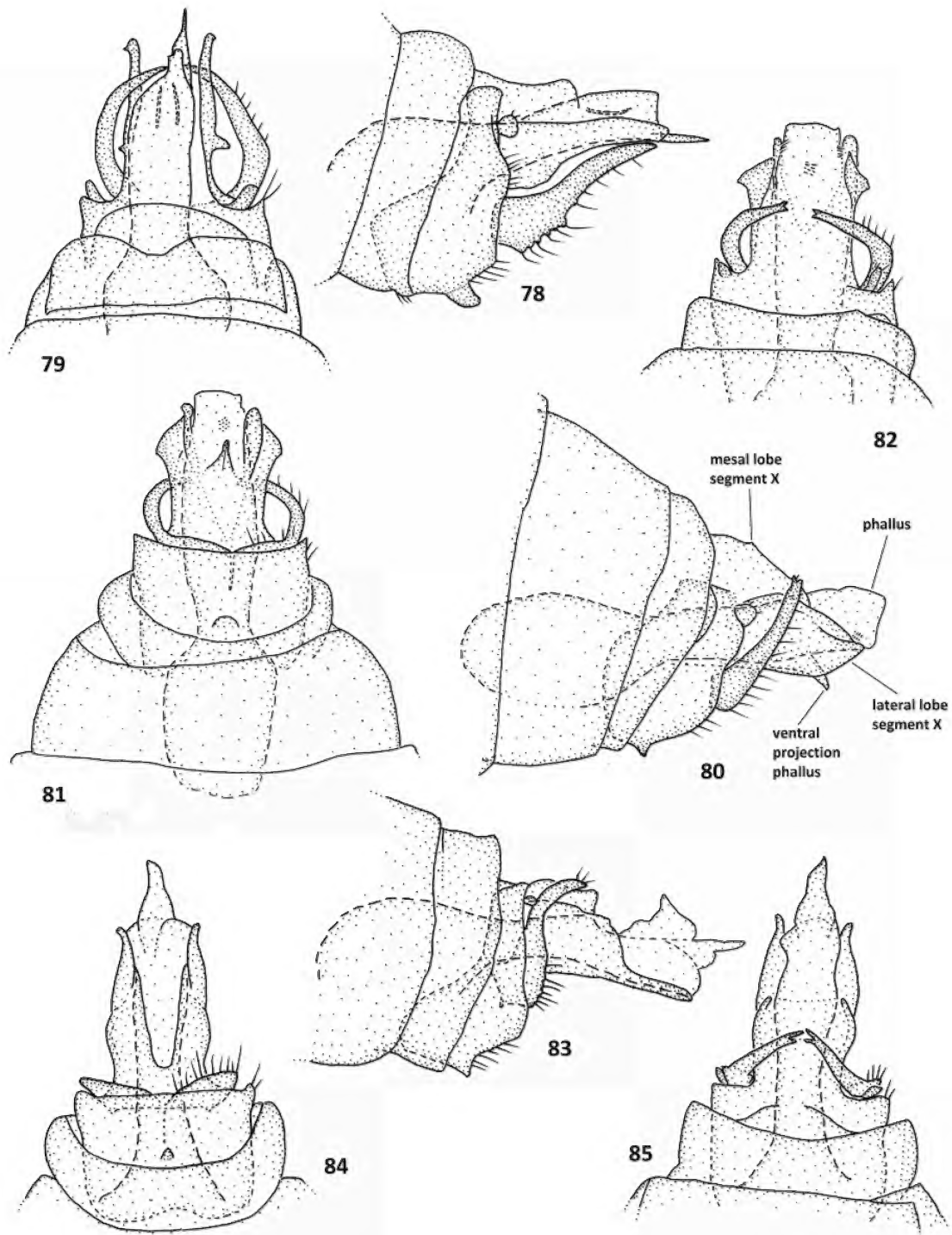
Type material not seen. Holotype. Male. PNG, Eastern Highlands, Aiyura, 5500 feet (1676 m, 6° 20' S, 145° 53' E), 12 September 1960, J.H. Barrett (QM, T-6205).

Paratype. PNG, male (gen prep. PT-1307 figured in Neboiss, 1986a, 1987a), collected with holotype (Department of Entomology, University of Queensland).

**Material examined.** 1 male (in alcohol, specimen CT-348 partly figured), PNG: Eastern Highlands, Ukarumpa, Bai River (about 6° 34' S, 145° 88' E), lt tr, 22 June 1986, A. Wells (NMV).

**Diagnosis.** The males of *C. aiyura* can be separated from *C. newguineana* and *C. sedlaceki*, in particular, and all other New Guinea species, by the combination of the inferior appendages in lateral view angled at about 30° to horizontal with irregular, serrated meso-ventral margin and the lateral lobes of segment X with triangular flanges in the basal half and slightly out turned apices and the emergent apical spine on the phallus (or acute ventromesal projection of the phallobase?).

**Description** (revised after Korboot, 1965, Neboiss, 1987a). General body colour and wings fawn (faded; personal observation) to yellowish head and thorax with blackish wings (Korboot, 1965: p. 40). Wings (Korboot, 1965: fig. 1) similar to



Figures 78–85. *Chimarra* spp.; 78–79, *Chimarra aiyyura* Korboot, male, genitalia; 78, lateral; 79, dorsal. 80–82, *Chimarra bicuspidis* sp. nov., male, holotype, genitalia; 80, lateral; 81, ventral; 82, dorsal. 83–85, *Chimarra bifida* sp. nov., male, holotype, genitalia; 83, lateral; 84, ventral; 85, dorsal.

those of *C. ukarumpana* (fig. 7). Length of forewing: male 5.5–5.7 mm. Forewings with forks 1, 2, 3 and 5 present, Rs straight, not thickened (Korboot, 1965: fig. 1) to slightly sinuous or curved, moderately thickened, basad of discoidal cell (personal observation); hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally weakly angled or rounded, ventral process short, basal to distal margin of segment IX, in lateral view, keel-like, length about same as width, preanal appendages with rounded apices, in lateral view appear rounded (fig. 78; Neboiss, 1987a: fig. 4), in dorsal view appear ovate (fig. 79). Segment X lateral lobes laterally compressed with sensilla not discerned (figs 78, 79), in dorsal view, lateral lobes appear slender with small, triangular flange in basal half, apices slightly out turned (fig. 79; Neboiss, 1987a: fig. 5). Phallus with two slender spines included subapically and one emergent apical spine (or acute ventromesal projection of the phallobase?; figs 78, 79; Neboiss, 1987a: figs 4, 6). Inferior appendages slender, broadest in basal third, narrowed slightly near middle, tapered slightly in distal half, apices acute and directed slightly posteromesally (figs 78, 79), in lateral view, angled at about 30° to horizontal, length about 3.3 times width, dorsal margin slightly concave in basal half and ventral margin slightly irregularly convex in basal half and almost straight in distal half (fig. 78; Neboiss, 1987a: fig. 4), in dorsal view, mesal and lateral margins slightly curved (fig. 79; Neboiss, 1987a: fig. 5).

**Female.** Unknown.

**Remarks.** *Chimarra aiyura* is known from three males from two adjacent localities in the Eastern Highlands of PNG. New figures have been drawn to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Chimarra* genitalic structures from Korboot's (1965) original and Neboiss' (1987a) revised description. Neboiss examined the holotype abdomen mounted on a slide but found the individual appendages difficult to interpret, so he cleared the paratype abdomen, compared it with the holotype and prepared new figures (Neboiss 1987a: 132; figs 4–6). I have followed Neboiss' interpretation and figures.

### *Chimarra bicuspidis* sp. nov.

Figures 80–82

**Holotype.** Male (specimen in alcohol, CT-349, figured), PNG, Central Province, Aieme River, about 9° 25' S, 147° 15' E, net, 23 June 1986, A. Wells (NMV, T-22458).

**Diagnosis.** The male of *C. bicuspidis* is similar to *C. bifida* and *C. kokodana* Kimmins in the bifid apices on the inferior appendages, but can be separated from the latter two and all other New Guinea species by the combination of the inferior appendages being relatively straight, angled at about 70° to horizontal in lateral view and with bifid apices.

**Description.** General body colour and wings pale (faded). Wings similar to those of *C. ukarumpana* (fig. 7). Length of forewing: male 4.5 mm. Forewing with forks 1, 2, 3 and 5 present, Rs not sinuous or curved, slightly thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally broadly rounded, ventral process short, basal to distal margin of segment IX, in lateral view, appears triangular, apex acute, length about 0.8 times basal width (fig. 80), in ventral view appears rounded apically (fig. 81), preanal appendages ovate (figs 81, 82). Segment X with lateral lobes (difficult to discern) relatively long, laterally compressed, aligned laterally and mostly adpressed to phallus, apices acute, sensilla not discerned (figs 80, 82), in lateral view, lateral lobes appear ovate (fig. 80), in dorsal and ventral views, appear slender, dilated or flanged subapically (figs 81, 82). Phallus without any included spines discerned, but with robust ventral projection (or acute ventromesal projection of the phallobase?) subapically (figs 80, 81). Inferior appendages slender, broadest in basal third, tapered slightly in distal two thirds, apices bifid and directed posteromesally (figs 80, 82), in lateral view, angled at about 70° to horizontal, length about 4.5 times width, dorsal margin slightly concave, ventral margin mostly straight (fig. 80), in dorsal view, mesal and lateral margins curved (fig. 82).

**Female.** Unknown.

**Etymology.** *Bicuspidis* – Latin for two points (of a spear; apices of inferior appendages).

**Remarks.** *Chimarra bicuspidis* is known only from the type locality in south-east PNG.

### *Chimarra bifida* sp. nov.

Figures 83–85

**Holotype.** Male (dried, pinned specimen CT-384 figured), Indonesia, Papua Province, W Sentani, 75 m, about 2° 36' S, 140° 37' E, June 1959, T.C. Maa (BPBM).

**Paratypes.** 1 male (dried, pinned specimen CT-385), Indonesia, Papua Province, collected with holotype (BPBM); 1 male (in alcohol, specimen CT-710), PNG, Western Highlands, Baiyer River Sanctuary, Trauna River, 5 35' S, 144 10' E, UV light, 17 June 1985, A. Wells (NMV).

**Diagnosis.** The males of *C. bifida* are similar to *C. kokodana* and *C. bicuspidis* in the bifid apices on the inferior appendages but can be separated from the latter two and all other New Guinea species, including *C. sinuosa*, by the combination of features on the inferior appendages, which in lateral view are sinusoidal with bifid apices.

**Description.** **Male.** General body colour and wings light brownish. Wings similar to those of *C. ukarumpana* (fig. 7). Length of forewing: male 4.5–4.7 mm. Forewing with forks 1, 2, 3 and 5 present, Rs straight, not sinuous or curved, slightly thickened, basad of discoidal cell.

**Male genitalia.** Segment IX anterior margin in lateral view, anteroventrally rounded (fig. 83), ventral process short, triangular, apex acute, basal to distal margin of segment IX (figs 83, 84), in lateral view, length about 0.7–0.8 times width, preanal appendages small, ovate (fig. 83). Segment X lateral lobes laterally compressed in basal half, apices narrowly rounded, with sensilla not discerned (figs 83–85), in lateral view, lobes broadest in basal half, narrowed strongly near

middle, slender in distal third (fig. 83), in dorsal and ventral views mostly adpressed to phallus (figs 84, 85). Phallus without any spines discerned. Inferior appendages broadest in basal half, tapered slightly distally, apices bifid, directed posteromesally (figs 83–85), in lateral view, angled near perpendicularly, sinusoidal, dorsal margin convex, ventral margin convex in basal half, concave in distal half (fig. 83).

*Female.* Unknown.

*Etymology.* *Bifida* – Latin for forked, split, divided into two parts (apices of inferior appendages).

*Remarks.* *Chimarra bifida* is known from three males collected from both north-east West Papua and central PNG. The two sites are separated by about 530 km in a straight line.

### ***Chimarra biramosa* Kimmins, 1957**

Figure 86

*Chimarra biramosa* Kimmins, 1957: 292; figs 4a, 5.—Neboiss, 1986: 108.—Cartwright, 2001: 225, figs 10–12, 16, 21.

Type material not seen. Holotype. Male, Solomon Islands, Guadalcanal Island, Tapenanje, 10–15 December 1953, J.D. Bradley (BMNH).

*Material examined.* PNG. 1 male (in alcohol, specimen CT-333 partly figured), Western Highlands District, Pengi Creek, Bayer River Sanctuary, about 5° 31' S, 144° 11' E, lt tr, 16 June 1986, A. Wells (NMV).

*Diagnosis.* The males of *C. biramosa* and *C. felkora* Oláh can be separated from all other New Guinea species, by the branched inferior appendages, in lateral view. *Chimarra felkora* differs from *C. biramosa* in that the dorsal branch of the inferior appendage is strongly hooked, not straight or inclined as in *C. biramosa*.

*Description* (revised after Kimmins, 1957; Cartwright, 2001). General body colour and wings pale (faded) to brownish. Wings (Kimmins, 1957: fig. 4A) similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.1–4.5 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened, basad of discoidal cell (Kimmins, 1957: fig. 4A); hind wing with forks 1, 2, 3 and 5 present.

*Male.* Segment IX anterior margin in lateral view, anteroventrally angular or sub-truncate (fig. 86; Kimmins, 1957: fig. 5A), ventral process short, basal to distal margin of segment IX (fig. 86), in lateral view, semi-triangular, apex sub-acute (fig. 86; more rounded distally in Kimmins, 1957: fig. 5A; Neboiss, 1986a: fig. p. 108), length about 0.6–0.7 width, preanal appendages, ovate (fig. 86; Kimmins, 1957: figs 5A, 5B). Segment X lateral lobes laterally compressed with sensilla not discerned, in lateral view, robust, apices slightly downturned (fig. 86; Kimmins, 1957: fig. 5A; Neboiss, 1986a: fig. p. 108), in dorsal view lateral lobes slender, apices acute, slightly in turned (Cartwright, 2001: fig. 12; Kimmins, 1962: fig. 5B). Phallus with one slender spine included subapically and a larger emergent (asymmetric) spine more basally (fig. 86; Cartwright 2001: figs 10–12; Kimmins, 1957: fig. 5B). Inferior appendages

branched, in lateral view, ventral branch directed nearly horizontally, dorsal branch directed almost vertically (fig. 86; Kimmins, 1962: fig. 5A; Neboiss, 1986a: fig. p. 108), in ventral view sub-ovate, apices acute (Cartwright, 2001: fig. 11; Kimmins, 1962: fig. 5C; Neboiss, 1986a: fig. p. 108).

*Female.* Described by Kimmins, 1957 (fig. 5D; Cartwright, 2001: fig. 21; Neboiss, 1986a: fig. p. 108).

*Remarks.* *Chimarra biramosa* is known from many males (and females) from the Solomon Islands (Johanson and Espeland, 2010; Kimmins, 1957) and PNG – Bougainville Island (Cartwright, 2001), New Britain (Oláh and Mey, 2013) and Western Highlands District. A new figure has been drawn to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Chimarra* genitalic structures from Kimmins' (1957) original and Cartwright's (2001) revised description. The one mainland PNG male specimen illustrated in this study, differs slightly from the type specimen. In Kimmins' (1957) figure, the dorsal branch of the bifid inferior appendages, in lateral view, appears more robust than the ventral; in Cartwright's (2001) figure, the dorsal and ventral branches appear nearly equally robust, but in the specimen studied here (fig. 86), the ventral branch appears more robust than the dorsal. These differences may be real or a matter of perspective in the different drawings.

### ***Chimarra kewabi* sp. nov.**

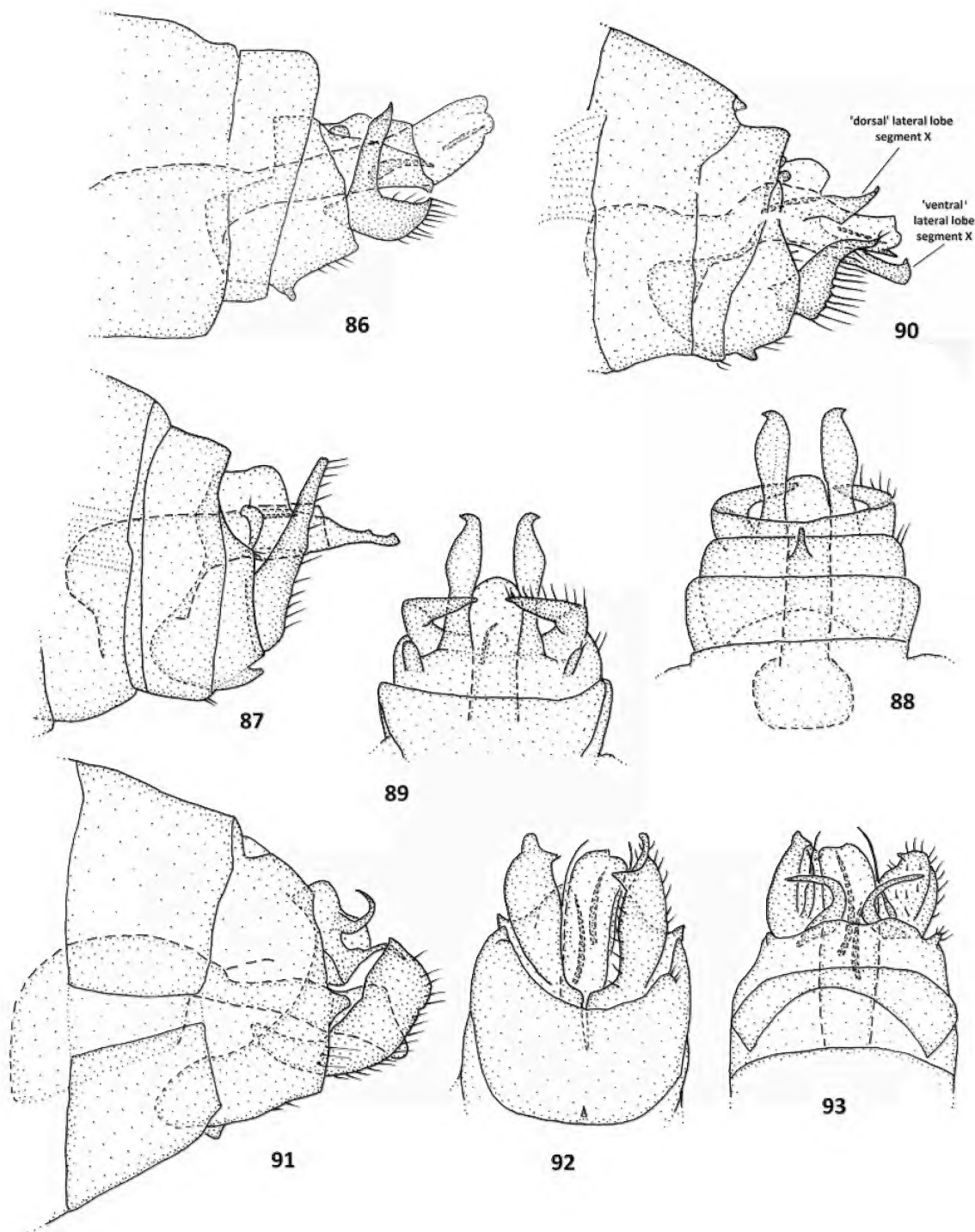
Figures 87–89

Holotype. Male (dried, pinned specimen CT-405 figured), PNG, Southern Highlands District, Mount Ialibu, 2650 m?, about 6° 15' S, 144° 03' E, 8–14 September 1968, J.L. Gressitt (BPBM).

*Diagnosis.* The male of *C. kewabi* can be separated from all other New Guinea species, including *C. sinuosa* and *C. falcata*, by the combination of characters that include the lateral lobes of segment X, which are dorso-ventrally flattened in the distal half in lateral view, with two small projections (sensilla?) subapically (like *C. sinuosa*), but in dorsal and ventral views, they are dilated in the distal half and the inferior appendages are slender, inflexed apically, almost positioned perpendicularly and tapered gradually distally, in lateral view.

*Description.* General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 6.8 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, slightly thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

*Male.* Segment IX anterior margin in lateral view, anteroventrally broadly rounded (fig. 87), ventral process short, sub-triangular, apex acute, apex nearly level with distal margin of segment IX (figs 87, 88), in lateral view, length about 0.7 width, preanal appendages slightly laterally flattened, in lateral view, rounded (fig. 87), in dorsal view, appear rod-shaped (fig. 89). Segment X lateral lobes slightly dorso-ventrally flattened in distal half, apices slightly outwardly angled, in lateral view, broadest in basal half, tapered in distal half, with two subapical projections (sensilla?; fig. 87), in dorsal and ventral views, lobes



Figures 86–93. *Chimarra* spp.; 86, *Chimarra biramosa* Kimmins, male, genitalia, lateral. 87–89, *Chimarra kewabi* sp. nov., male, holotype, genitalia; 87, lateral; 88, ventral; 89, dorsal. 90: *Chimarra ulmeri* Kimmins, male, genitalia, lateral. 91–93, *Chimarra bicornis* sp. nov., male, holotype, genitalia; 91, lateral; 92, ventral; 93, dorsal.

robust, slightly dilated with curved margins in distal half (figs 88, 89). Phallus with one short, slender spine embedded subapically (figs 87, 89). Inferior appendages broadest in basal half, tapered distally, apices acute and directed posteromesally (figs 87–89), in lateral view, angled nearly vertically at about 80° to horizontal, length about 4 times width at base, dorsal and ventral margins mostly straight (fig. 87), in dorsal view, mesal and lateral margins angled near midlength (fig. 89).

*Female.* Unknown.

*Etymology.* *Kewabi* – named for the native PNG language spoken in the area near the type locality.

*Remarks.* *Chimarra kewabi* is known from the type locality in central PNG.

### ***Chimarra ulmeri* Kimmins, 1962**

Figure 90

*Chimarra ulmeri* Kimmins, 1962: 114; figs 15, 16.—Neboiss, 1986: 106.

Type material not seen. Holotype. Male (dried, pinned specimen), PNG, Kokoda, 1200 ft (366 m), June–July 1933, L.E. Cheeseman (BMNH).

*Material examined.* PNG. 1 male (dried, pinned specimen CT-401 partly figured), Oro District, Kokoda, 400 m, about 8° 53' S, 147° 45' E, 15–20 November 1965, J. and M. Sedlacek (BPBM); 3 males (CT-335), (Morobe Province) Bullo, Taun Creek, about 7° 10' S, 146° 38' E, UV light, 4 June 1986, A. Wells (NMV).

*Diagnosis.* The males of *C. ulmeri* can be separated from all other New Guinea species, including *C. bicornis*, by the sclerotised branches of the lateral lobes of segment X, which are both hooked dorsally (Kimmins, 1962: figs 16A, 16B) or posterodorsally, in lateral view.

*Description.* General body colour and wings fawn or light brownish. Wings (Kimmins, 1962: fig. 15); similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.7–5.7 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened basad of discoidal cell (Kimmins, 1962: fig. 15); hind wing with forks 1, 2, 3 and 5 present.

*Male genitalia.* (Revised after Kimmins, 1962). Segment IX anterior margin in lateral view, anteroventrally rounded (fig. 90; Kimmins, 1962: fig. 16A), ventral process in lateral view short, sub-triangular, basal to distal margin of segment IX, length about 0.6–0.7 width, preanal appendages, in lateral view, rounded (fig. 90; Kimmins, 1962: fig. 16A), in dorsal view, appear rod-like (Kimmins, 1962: fig. 16B). Segment X lateral lobes branched, with sensilla not discerned, in lateral view dorsal lateral lobe sclerotised, slender and slightly (fig. 90) or strongly upturned distally (Kimmins, 1962: fig. 16A), slightly out turned distally in dorsal view (Kimmins, 1962: fig. 16B), ventral lateral lobe slightly laterally compressed (Kimmins, 1962: figs 16A, B), in lateral view upturned (fig. 90), in dorsal view, slender and diverging posteriorly (Kimmins, 1962: fig. 16B). Phallus with two slender spines included subapically and a larger partly emergent spine from the apex of

the phallobase. Inferior appendages broadest in basal half, tapered distally, apices acute and directed slightly posteromesally (fig. 90; Kimmins, 1962: figs 16A, C), in lateral view angled about 30–45° to horizontal, length about 2.5–2.8 times width, sinusoidal, dorsal margin slightly convex, ventral margin concave in distal half (fig. 90; Kimmins, 1962: fig. 16A), in ventral view lateral margin strongly convex, mesal margin irregularly concave (Kimmins, 1962: fig. 16C).

*Female.* Unknown (3 females collected with the holotype are referred with some doubt to this species, but undescribed (Kimmins, 1962: p. 115).

*Remarks.* *Chimarra ulmeri* is known from five males (and three females?) from three localities in the Oro and Morobe Districts of eastern PNG. A new figure has been drawn to allow direct comparisons and to accompany the description that is revised in light of variations in *Chimarra* genitalic structures from Kimmins' (1962) original description. The new specimens differ slightly from the type specimen in the shape of the branched lateral lobes of segment X, but I feel are still best placed with *C. ulmeri*.

### ***Chimarra bicornis* sp. nov.**

Figures 91–93

Holotype. Male (figured specimen CT-364), PNG (Morobe Province), Wau, Big Wau Creek, 1300 m, about 7° 20' S, 146° 43' E, November 1965, P. Shanahan (BPBM).

*Diagnosis.* *Chimarra bicornis* is similar to *C. ulmeri* but different to all other New Guinea *Chimarra* species in having a pair of sclerotised, curved dorsal and ventral branches of the lateral lobes on segment X. In *C. ulmeri*, the apices of the dorsal or upper branch of the lateral lobes are directed dorsally (Kimmins, 1962: fig. 16A; Neboiss, 1986a: fig. p. 106) or posterodorsally (fig. 90), whereas in *C. bicornis*, they are directed dorso-laterally. (There is also a species from northern Australia with a similar pair of curved mesal processes on segment X – *C. adaluma* Cartwright [Cartwright, 2002]).

*Description.* General body colour and wings brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.9 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, slightly thickened, basad of discoidal cell.

*Male.* Segment IX anterior margin in lateral view, with rounded extension anteroventrally (fig. 91), ventral process small, sub-triangular, situated basally on segment IX (figs 91, 92), in lateral view, length about 0.6 times width (fig. 91). Segment X lateral lobes sclerotised, short, slender, with dorsal and ventral branches, dorsal branch directed dorso-laterally, ventral branch directed ventro-posteriorly, with sensilla not discerned (figs 91, 93). Phallus with two slender spines included subapically (figs 92, 93). Inferior appendages short, robust, acute apices angled dorso-mesally (figs 91–93), in lateral view, angled at about 45° to horizontal, subquadrate, length about 2.5 times width, broadest in distal half, tapered slightly basally (fig. 91), in ventral view, appear sub-ovate, length about 2.8 times width (fig. 92).

*Female.* Unknown.

*Etymology.* *Bicornis* – Latin for two horned, two pronged (paired curved, dorsal branches of lateral lobes on segment X).

*Remarks.* *Chimarra bicornis* is known only from the holotype male in north-east PNG.

### *Chimarra sinuosa* Kimmins, 1962

Figure 94

*Chimarra sinuosa* Kimmins, 1962: 118; figs 21, 22.—Neboiss, 1986: 105.

Type material not seen. Holotype. Male. Indonesia, Papua Province, Cyclops Mountains, Sabron, Camp 2, 2000 ft (about 610 m), July 1936, L.E. Cheesman (BMNH).

*Material examined.* Indonesia. 1 male (dried, pinned specimen CT-381 partly figured), Papua Province, Hollandia area, Sentani, 90 m, about 2° 36' S, 140° 37' E, Malaise trap over stream, 15–18 June 1959, collector unknown (Gressitt or Maa?; BPBM).

*Diagnosis.* The males of *C. sinuosa* are similar to *C. bifida* in the sinusoidal shape of the inferior appendages, and to *C. kewabi* in the shape of the lateral lobes of segment X, with two subapical projections (sensillae?) in lateral view. *C. sinuosa* can be separated from *C. bifida* and *C. kewabi* and all other New Guinea species by the combination of these two characters and inferior appendages with simple, acute, inflexed apices.

*Description.* (Revised after Kimmins, 1962). General body colour and wings light brownish. Wings (Kimmins, 1962: fig. 21), similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.7 mm (Kimmins, 1962: p. 118). Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, moderately thickened, basad of discoidal cell (Kimmins, 1962: fig. 21); hind wing with forks 1, 2, 3 and 5 present.

*Male.* Segment IX anterior margin in lateral view, anteroventrally broadly rounded (fig. 94), ventral process short triangular (Kimmins, 1962: fig. 22A), basal to distal margin of segment IX, in lateral view, length about 0.6 times basal width (fig. 94), preanal appendages ovate. Segment X lateral lobes with two subapical projections (sensilla?; fig. 94, Kimmins, 1962: figs 22A, B), in lateral view, lateral lobes robust, broadest in basal half, narrowed in distal half. Phallus without any obvious included spines. Inferior appendages slender, broadest basally, with acute apices directed posteromesally (fig. 94, Kimmins, 1962: figs 22A, B), in lateral view angled at about 45° to horizontal, slightly tapering in basal half, almost uniformly narrow and sinusously curved in apical half (fig. 94), in dorsal view, mesal and lateral margins curved (Kimmins, 1962: figs 22B, C; Neboiss, 1986a: fig. p. 105).

*Female.* Unknown.

*Remarks.* *Chimarra sinuosa* is known only from two male specimens from two localities in the north-east of West Papua. A new figure has been drawn to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Chimarra* genital structures from Kimmins' (1962) original description.

### *Chimarra karimui* sp. nov.

Figures 95–97

Holotype. Male (dried, pinned specimen CT-388 figured), PNG, Western Highlands Province, Karimui (south-west of Goroka), about 6° 32' S, 144° 47' E, lt tr, 3 April 1963, J.L. and M. Gressitt (BPBM).

Paratype. PNG. 1 male (dried, pinned specimen CT-373), Western Highlands Province, Karimui, south of Goroka, 1000 m, about 6° 32' S, 144° 47' E, lt tr, 2 June 1961, J.L. and M. Gressitt (BPBM).

*Diagnosis.* The males of *C. karimui* can be separated from all other New Guinea species, including *C. sinuosa* and *C. wara*, by a combination of features, including the lateral lobes of segment X, with apex laterally directed and acute with a small preapical process (possibly sensilla-bearing), and likely on the ventral margin and the inferior appendages, which are broad basally, tapered gradually and slender in the distal half with acute apices.

*Description.* General body colour and wings fawn to light brown. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.7–6.1 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately to strongly sinuous or curved, thickened, basad of discoidal cell.

*Male.* Segment IX anterior margin in lateral view, with narrowly rounded extension ventrally (fig. 95), ventral process short, basal to distal margin of segment IX (figs 95, 96), in lateral view sub-triangular, length about 0.6 times width, preanal appendages fused basally, rounded apically (fig. 95). Segment X lateral lobes with apex laterally directed and acute with a small preapical process (possibly sensilla-bearing), and likely on the ventral margin (figs 96, 97), in lateral view appears broad basally, narrowed near middle (fig. 95). Phallus with no included spines obvious. Inferior appendages broadest in basal half, tapered and slender distally, apices very acute, directed slightly posteromesally (figs 95–97), in lateral view, angled nearly vertically at about 80° to horizontal, length about 3 times maximum width, ventral margin angled strongly in basal third, dorsal and ventral margins curved in distal half (fig. 95), in dorsal and ventral views, mesal and lateral margins straight to very slightly curved in distal half (figs 96, 97).

*Female.* Unknown.

*Etymology.* *Karimui* – named for the type locality (Karimui).

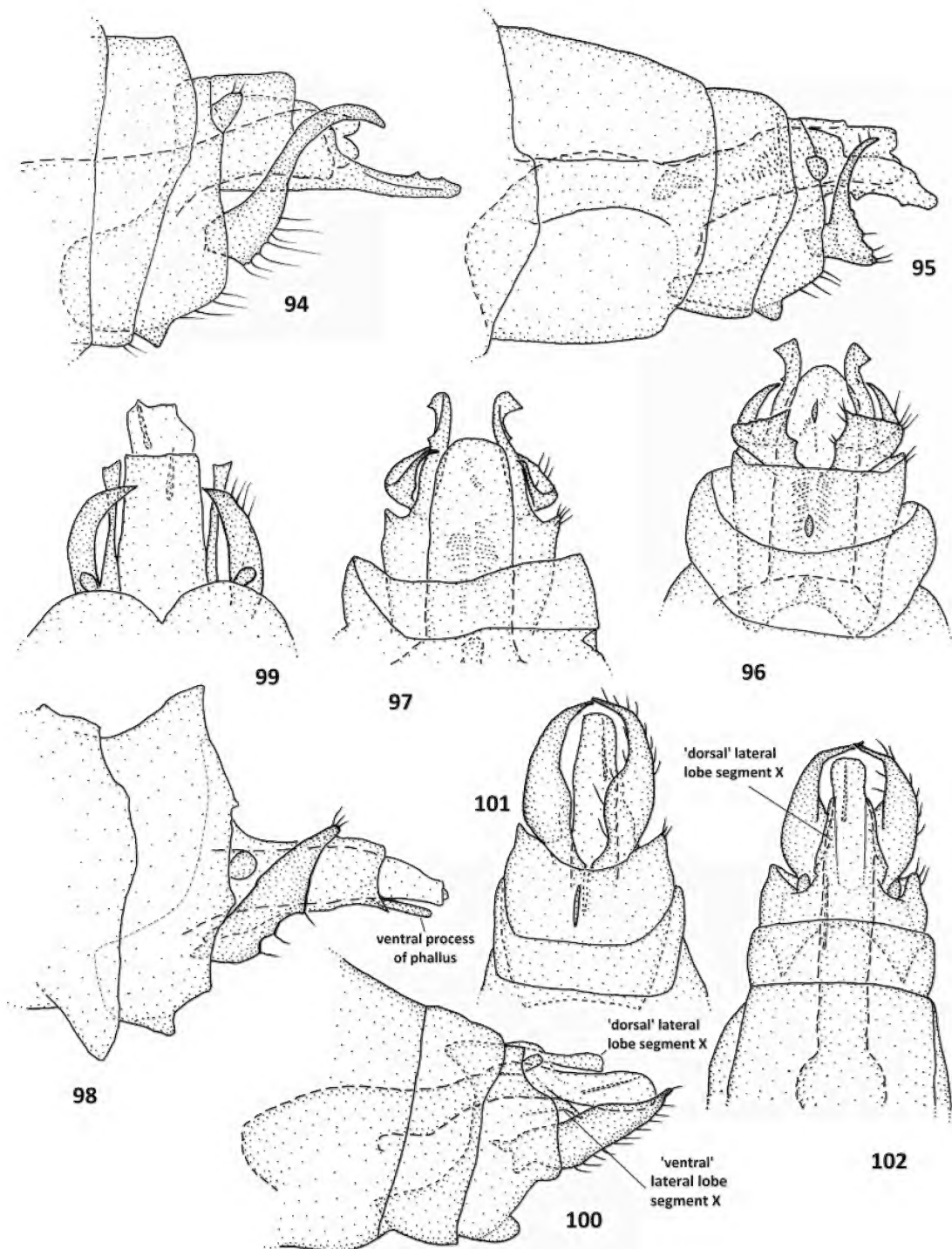
*Remarks.* *Chimarra karimui* is known from two males from near the type locality in central PNG.

### *Chimarra laensis* sp. nov.

Figures 98, 99

Holotype. Male (dried, pinned specimen CT-369 figured), PNG, Morobe District, Lae, Singnawa River, 30 m (6° 45' S, 147° 10' E), 3 April 1966, lt tr Kunai grass, O.R. Wilkes (BPBM).

*Diagnosis.* The male of *C. laensis* can be separated from all other New Guinea species, including *C. aiyyura*, by the combination of the irregular, almost broadly serrated meso-ventral margin on the inferior appendages and the absence of a flange in the basal half of the lateral lobes of segment X, in dorsal view.



Figures 94–102. *Chimarra* spp.; 94, *Chimarra sinuosa* Kimmins, male, genitalia, lateral. 95–97, *Chimarra karamui* sp. nov., male, holotype, genitalia; 95, lateral; 96, ventral; 97, dorsal. 98–99, *Chimarra laensis* sp. nov., male, holotype, genitalia; 98, lateral; 99, dorsal. 100–102, *Chimarra sappela* sp. nov., male, holotype, genitalia; 100, lateral; 101, ventral; 102, dorsal.

**Description.** General body colour and wings light brownish. Wings similar to those of *C. ukarumpana* (fig. 7). Length of forewing: male 4.9 mm. Forewing with forks 1, 2, 3 and 5 present, Rs very slightly sinuous or curved, thickened, basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, anteroventrally broadly angular or sub-truncate, ventral process short, basal to distal margin of segment IX, in lateral view, keel-like, length about 0.6 times basal width, preanal appendages, slightly laterally compressed, appear rounded in lateral view (fig. 98), in dorsal view appear ovate (fig. 99). Segment X lateral lobes laterally compressed in basal three quarters, appear truncate distally, with sensilla not discerned (figs 98, 99), in lateral view robust (fig. 98), in dorsal view lateral lobes appear slender. Phallus with two short, slender spines included subapically and spine-like ventral process (apex of phallobase?; fig. 99). Inferior appendages short with apices acute, angled slightly posteromesally (figs 98, 99) in lateral view, broadest in basal half, tapered slightly distally, angled at about 45° to horizontal, length about 3.6 times width, dorsal margin slightly convex and ventral margin in basal half with three small projections with slight concavities between them, slightly concave in distal half (fig. 98), in dorsal view mesal and lateral margins slightly curved (fig. 99).

**Female.** Unknown.

**Etymology.** *Laensis* – named for the type locality (Lae).

**Remarks.** *Chimarra laensis* is known from the type locality in north-east PNG. I realise that the type specimen may not be in good shape, and the illustration is very incomplete, but the shape of the inferior appendage is distinctive in lateral view.

### ***Chimarra sappela* sp. nov.**

Figures 100–102

**Holotype.** Male (dried, pinned specimen CT-392 figured), PNG, Morobe District, Wau, 1200 m, about 7° 20' S, 146° 43' E, 7 July 1961, J. Sedlacek (BPBM).

**Diagnosis.** The male of *C. sappela* can be separated from all other New Guinea species, including *C. morobensis*, by the combination of the robust pincer-like inferior appendages with almost straight ventral margin, tapered in distal half, with acute apices angled meso-distally, plus the slender, hooked ventral lateral lobes of segment X, situated below the phallus in lateral view.

**Description.** General body colour and wings light brownish. Wings similar to those of *C. ukarumpana* (fig. 7). Length of forewing: male 5.1 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened, basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, anteroventrally angular (fig. 100), ventral process short, basal to distal margin of segment IX (figs 100, 101), in lateral view, keel-like with rounded distal margin, length about half width, preanal appendages ovate (figs 100, 102). Segment X lateral

lobes with sensilla not discerned (fig. 102), dorsal lateral lobes relatively long, situated slightly above phallus (fig. 100), in dorsal view lobes elongate, triangular (fig. 102), ventral lateral lobes short, slender, hooked, apices angled downwards below phallus (fig. 100). Phallus with one slender spine included subapically (figs 100–102). Inferior appendages broadest in basal half, tapered in distal half to acute apices directed posteromesally (figs 100–102), in lateral view, angled at about 30° to horizontal, length about 3.7 times width, dorsal margin slightly concave in distal half and ventral margin mostly straight (fig. 100), in ventral and dorsal views, mesal and lateral margins slightly curved (figs 101, 102).

**Female.** Unknown.

**Etymology.** *Sappela* – New Guinea Pidgin for sharp (apices of inferior appendages).

**Remarks.** *Chimarra sappela* is known from the type locality in north-east PNG.

### ***Chimarra erecta* sp. nov.**

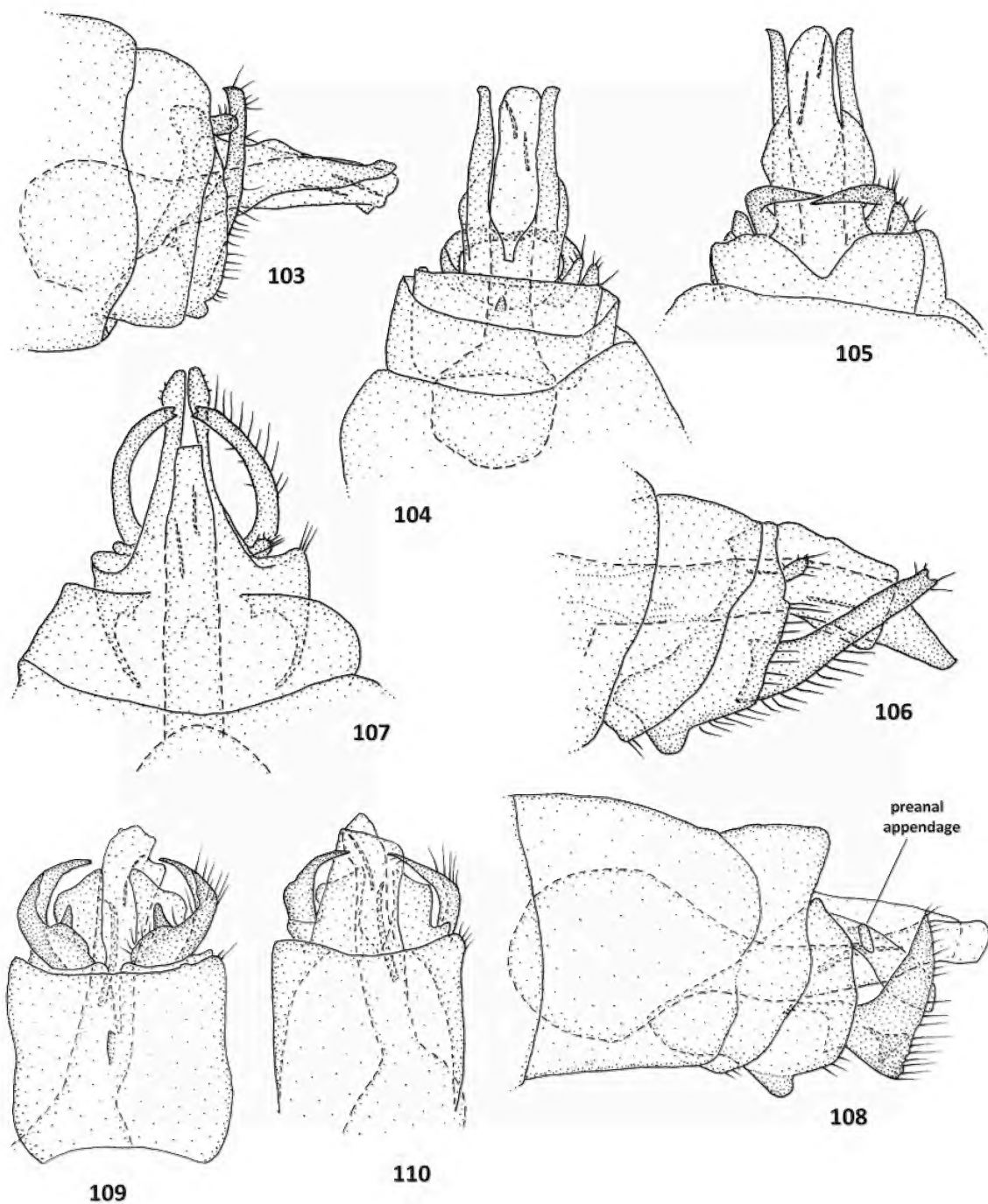
Figures 103–105

**Holotype.** Male (dried, pinned specimen CT-358 figured), PNG, Morobe Province, Wau, 1200 m, about 7° 20' S, 146° 43' E, Malaise trap, 7 July 1961, J. Sedlacek (BPBM).

**Diagnosis.** The male of *C. erecta* can be separated from all other New Guinea species, particularly *C. verticilis*, by the combination of the vertically directed inferior appendages, with acute apices directed dorsomesally and the lateral lobes of segment X, which are angularly bent on the dorsal margin in the basal half. Inferior appendages in lateral view are tapered weakly distally.

**Description.** General body colour and wings brownish. Wings similar to those of *C. ukarumpana* (fig. 7). Length of forewing: male 5.7 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, not thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally weakly angular (fig. 103), ventral process short, basal to distal margin of segment IX (figs 103, 104), in lateral view, keel-like with rounded distal margin, length about half width (fig. 103), in ventral view, sub-triangular, apex acute (fig. 104), preanal appendages ovate (figs 103, 105). Segment X lateral lobes relatively long, aligned laterad alongside phallus, with no sensilla discerned (figs 103–105), in lateral view slightly tapered distally, apices appear slightly bulbous (fig. 103), in dorsal and ventral views, angularly bent on the dorsal margin in basal half, slender in distal half, apices appear slightly out turned (figs 104, 105). Phallus with two slender spines included subapically (figs 103–105). Inferior appendages broadest in basal half, slightly tapered in distal half, apices slender, acute, directed dorsomesally (figs 103, 105), in lateral view, perpendicular, length about 3.5 times width, dorsal margin weakly concave and ventral margin slightly convex (fig. 103), in ventral and dorsal views, mesal and lateral margins slightly curved (fig. 105).



Figures 103–110. *Chimarra* spp.; 103–105, *Chimarra erecta* sp. nov., male, holotype, genitalia; 103, lateral; 104, ventral; 105, dorsal. 106–107, *Chimarra kokodana* Kimmins, male, genitalia; 106, lateral; 107, dorsal. 108–110, *Chimarra espelandae* sp. nov., male, holotype, genitalia; 108, lateral; 109, ventral; 110, dorsal.

*Female.* Unknown.

*Etymology.* *Erecta*—Latin for upright, erect (inferior appendages).

*Remarks.* *Chimarra erecta* is known from the type locality in north-east PNG.

### ***Chimarra kokodana* Kimmins, 1962**

Figures 106, 107

*Chimarra kokodana* Kimmins, 1962: 119; figs 23, 24.—Neboiss, 1986a: 109.

Type material not seen. Holotype. Male, PNG, Kokoda, 1200 ft (about 366 m), August 1933, L.E. Cheeseman (BMNH).

*Material examined.* PNG, Central Province. 1 male (dried, pinned specimen CT-356 partly figured), Mamai Plantation, east of Port Glasgow, 150 m, about 10° 16' S, 149° 30' E, lt tr, 29 January 1965, R. Straatman (BPBM); 14 males (CT-345), Iomari Creek, Bereima—Port Moresby Rd, about 9° 25' S, 147° 15' E, UV light, 23 May 1986, A. Wells and W. Ismay (NMV).

*Diagnosis.* The males of *C. kokodana* are similar to *C. bifida* and *C. bicuspidis* in the bifid apices on the inferior appendages, but can be separated from the latter two and all other New Guinea species, by the combination of the inferior appendages, which are relatively straight and angled at between about 30° and 45° to horizontal in lateral view, with bifid apices and the rounded, keel-like ventral process on segment IX.

*Description.* (Revised after Kimmins, 1962). General body colour and wings fawn (personal observation) to ochraceous (Kimmins 1962: p. 119). Wings (Kimmins, 1962: fig. 23), similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 3.8–4.8 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, strongly thickened, basal to discoidal cell (Kimmins, 1962: fig. 23); hind wing with forks 1, 2, 3 and 5 present.

*Male.* Segment IX anterior margin in lateral view, anteroventrally rounded (fig. 106, Kimmins, 1962: fig. 24A), ventral process short, basal to distal margin of segment IX, in lateral view, keel-like with rounded distal margin, length about half basal width (fig. 106), preanal appendages, ovate (figs 106, 107). Segment X lateral lobes relatively long, aligned laterad to phallus, sensilla not discerned (figs 106, 107), in lateral view, appears tapered in distal third (fig. 106), in dorsal view slender, apices appear slightly dilated or bulbous (fig. 107; Kimmins, 1962: fig. 24B). Phallus with two slender spines embedded subapically. Inferior appendages slightly broader in basal third, apices directed posteromesally, bifid (figs 106, 107), in lateral view, angled at between about 30° (Kimmins, 1962: fig. 24A) and 45° to horizontal, length about 3.4 to 3.7 times width, dorsal and ventral margins straight in distal two thirds (fig. 106), in dorsal view mesal and lateral margins curved (fig. 107; Kimmins, 1962: fig. 24B).

*Female.* Unknown (a female was referred to this species with some doubt [Kimmins, 1962: p.121]).

*Remarks.* *Chimarra kokodana* is known from 17 male (and one female?) specimens from four localities in south-east PNG and

New Britain (referred to as *C. kokoda* by Oláh and Mey, 2013, p. 413). New figures have been drawn to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Chimarra* genitalic structures from Kimmins' (1962) original description.

### ***Chimarra espelandae* sp. nov.**

Figures 108–110

Holotype. Male (in alcohol, figured specimen CT-332), PNG, Central Province, Iomari Creek, Bereima, Port Moresby Rd, about 9° 25' S, 147° 15' E, 23 May 1986, A. Wells and W. Ismay (NMV, T-22460).

Paratypes. PNG. 3 males (in alcohol, CT-343), collected with holotype (NMV).

*Diagnosis.* The males of *C. espelandae* can be separated from all other New Guinea species by the combination of the sub-triangular inferior appendages in lateral view and the digitiform projection on the mesal margin of the inferior appendages.

*Description.* General body colour and wings pale or fawn (faded). Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 3.8–4.0 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, strongly thickened, basal of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

*Male.* Segment IX anterior margin in lateral view, with rounded extension ventrally (fig. 108), ventral process short, strongly basal to distal margin of segment IX (figs 108, 109), in lateral view keel-like, length about half basal width, rounded distal margin (fig. 108), in ventral view, appears slender with acute apex (fig. 109), preanal appendages appear digitiform in lateral view (fig. 108), slightly angular or sub-triangular in dorsal view (fig. 110). Segment X lateral lobes robust, sensilla not discerned (figs 108, 110), in lateral view, appear dilated slightly in distal half, angled disto-ventrally (fig. 108), in dorsal and ventral views appear sub-truncate distally (figs 109, 110). Phallus with two slender spines included subapically, basal spine more elongate. Inferior appendages broadest in basal half, tapered in distal half, apices directed posteromesally, acute (figs 108–110), in lateral view, angled at about 75° to horizontal, sub-triangular, length about twice maximum width, dorsal margin slightly concave in basal half, almost straight in distal half, ventral margin strongly angled in basal half, mostly straight in distal half (fig. 108), in ventral and dorsal views, mesal and lateral margins slightly curved (figs 109, 110), in ventral view, mesal margin with digitiform projection in basal third (fig. 109).

*Female.* Unknown.

*Etymology.* *Espelandae* – named after Marianne Espeland for her contribution to the study of *Chimarra* from the Solomon Islands.

*Remarks.* *Chimarra espelandae* is known from four males collected from the type locality in south-east PNG.

***Chimarra lalokiana* sp. nov.**

Figures 111–113

Holotype. Male (in alcohol, figured specimen CT-331), PNG, Central Province, Laloki River below Rouna Falls, 9° 25' S, 147° 23' E, 26 June 1986, UV light, A. Wells and W. Ismay (NMV, T-22464).

Paratypes. PNG. 2 males, collected with holotype (NMV).

**Diagnosis.** The males of *C. lalokiana* can be separated from all other New Guinea species by the apparent sub-rectangular shape of the inferior appendages, in lateral view.

**Description.** General body colour and wings pale (faded). Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.5–5.0 mm. Forewing with forks 1, 2, 3 and 5 present, Rs weakly sinuous or curved, moderately thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally weakly rounded (fig. 111), ventral process short, strongly basal to distal margin of segment IX (figs 111, 112), in lateral view keel-like, length about half basal width, distal margin rounded (fig. 111), in ventral view appears triangular (fig. 112), preanal appendages appear rounded in lateral view (fig. 111), angular in dorsal view (fig. 113). Segment X lateral lobes robust, plate-like, situated laterad of and below phallus, sensilla not discerned (figs 111–113), in ventral view appear tapered distally (fig. 112), in dorsal view appear sub-triangular distally (fig. 113). Phallus with two slender spines included subapically. Inferior appendages broadest in basal half, tapered very slightly distally, apices acute, directed posteromesally (figs 111–113), in lateral view, angled at about 45° to horizontal, length about twice width, appear rectangular and truncate distally, dorsal and ventral margins mostly straight (fig. 111), in ventral view, mesal and lateral margins slightly curved, mesal margin with about three small projections in basal three quarters (fig. 112).

**Female.** Unknown.

**Etymology.** *Lalokiana* – named for the type locality (Laloki River).

**Remarks.** *Chimarra lalokiana* is known from three males from the type locality in south-east PNG.

***Chimarra verticitas* sp. nov.**

Figures 114–116

Holotype. Male (dried, pinned specimen CT-351 figured), PNG, Morobe Province, Wau, about 7° 20' S, 146° 43' E, Malaise Trap, 7 July 1964, J. Sedlacek (BPBM).

Paratypes. PNG. 1 male (dried, pinned specimen CT-363), Morobe Province, Wau, 1250 m, about 7° 20' S, 146° 43' E, Malaise Trap, 30 August 1965, J. and M. Sedlacek (BPBM); 1 male (dried, pinned specimen PT-1267), Wau, 1200 m, about 7° 20' S, 146° 43' E, Malaise Trap, 9 March 1965, J. and M. Sedlacek (BPBM).

**Diagnosis.** The males of *C. verticitas* can be separated from all other New Guinea species, in particular *C. erecta*, *C. oláhi*, *C. aiyura* Korboot and *C. falcata* Kimmins, by the combination of the shape of the lateral lobes of segment X, which are slightly

laterally flattened and angled below the phallus as a pair of robust, tongue-shaped appendages and the inferior appendages which appear perpendicular and distally tapered, in lateral view.

**Description.** General body colour and wings brownish with golden head. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 6.2–7.0 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, slightly thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally weakly angular (fig. 114), ventral process short, triangular, basal to distal margin of segment IX (figs 114, 115), in lateral view length about half basal width (fig. 114), preanal appendages, appear rounded in lateral view (fig. 114), angular in dorsal view (fig. 116). Segment X lateral lobes robust, apices narrowly rounded, situated below phallus with subapical spine (sensilla?; figs 114, 116), in lateral view appear tapered distally (fig. 114), in ventral view apices directed slightly mesally, nearly touching (fig. 115). Phallus dilated apically, with two slender spines included subapically (figs 114–116). Inferior appendages broadest in basal half, tapered gradually distally, slender in distal half, apices acute, directed dorsomesally (figs 114, 116), in lateral view appear directed perpendicularly, length about 3.2 times width, sub-triangular, dorsal margin mostly straight, ventral margin slightly concave and crenulate in basal half (fig. 114).

**Female.** Unknown.

**Etymology.** *Verticitas* – Latin for vertical direction (inferior appendages in lateral view).

**Remarks.** *Chimarra verticitas* is known from three male specimens from the Wau district in north-east PNG.

***Chimarra antap* sp. nov.**

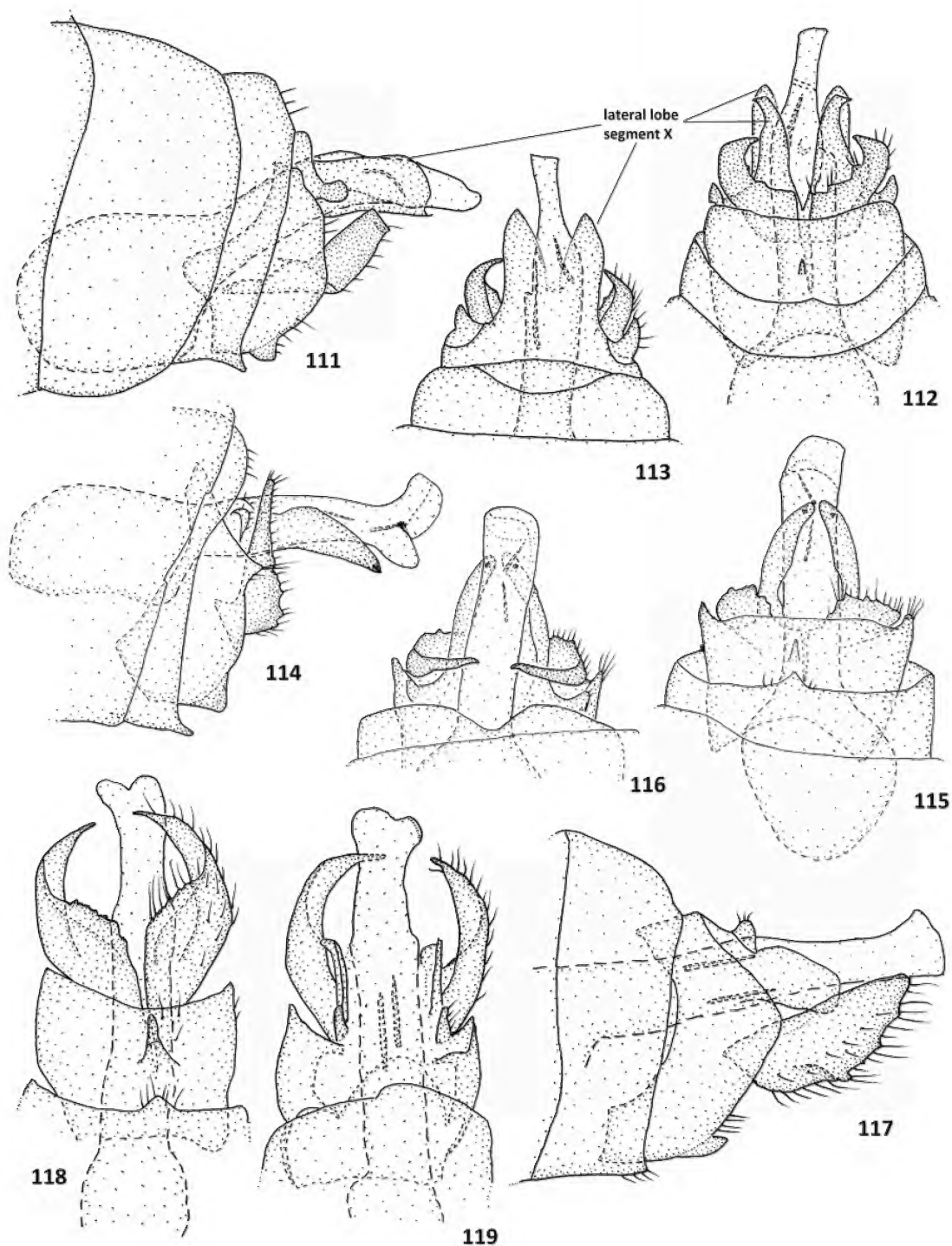
Figures 117–119

Holotype. Male (dried, pinned specimen PT-1482 figured), PNG, Southern Highlands Province, Mount Ialibu, 2660 m, about 6° 15' S, 144° 03' E, 8–18 Apr 1968, J.L. Gressitt (BPBM).

**Diagnosis.** The male of *C. antap* can be separated from all other New Guinea species by the shape of the inferior appendages, which are sub-semicircular in lateral view, with dorsal margin almost straight and ventral margin irregularly convex, together with the plate-like, laterally flattened lateral lobes of segment X.

**Description.** General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7), except forewing with discoidal cell apparently open. Length of forewing: male 6.5 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, not thickened, basad of (open) discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally angular or truncate (fig. 117), ventral process short, basal to distal margin of segment IX (figs 117, 118), in lateral view, keel-like, length about half basal width, distal



Figures 111–119. *Chimarra* spp.: 111–113, *Chimarra lolakiana* sp. nov., male, holotype, genitalia; 111, lateral; 112, ventral; 113, dorsal. 114–116, *Chimarra verticas* sp. nov., male, holotype, genitalia; 114, lateral; 115, ventral; 116, dorsal. 117–119, *Chimarra antap* sp. nov., male, holotype, genitalia; 117, lateral; 118, ventral; 119, dorsal.

margin weakly rounded (fig. 117), in ventral view appears sub-triangular, apex acute (fig. 118), preanal appendages appear ovate in lateral view (fig. 117), rod-like in dorsal view (fig. 119). Segment X lateral lobes laterally compressed, aligned alongside phallus, sensilla not discerned (figs 117, 118), in lateral view appear robust, sub-rectangular (fig. 117), in dorsal view, plate-like (fig. 117). Phallus with two slender spines included near midlength. Inferior appendages broadest near midlength, tapered distally, apices directed posteromesally (figs 117–119), in lateral view angled at about 30° to horizontal, length about 2.3 times width, appears sub-semicircular, dorsal margin almost straight, ventral margin slightly convex (fig. 117), in ventral view lateral margins curved, mesal margin crenulate near midlength (fig. 118).

*Female.* Unknown.

*Etymology.* *Antap* – New Guinea Pidgin for summit (type locality near summit of Mount Ialibu).

*Remarks.* *Chimarra antap* is known from a relatively high-altitude locality in central PNG.

#### ***Chimarra unidentata* sp. nov.**

Figures 120–122

*Holotype.* Male (dried, pinned specimen CT-400 figured), PNG, Central Province, Kokoda, 400 m, about 8° 53' S, 147° 45' E, lt tr, 15–20 November 1965, J. and M. Sedlacek (BPBM).

*Diagnosis.* The male of *C. unidentata* can be separated from all other New Guinea species by the short inferior appendages, which are tapered distally and possess a prominent sub-apical mesal projection.

*Description.* General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.2 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

*Male genitalia.* Segment IX anterior margin in lateral view, anteroventrally rounded (fig. 120), ventral process short, strongly basal to distal margin of segment IX (figs 120, 121), in lateral view shallow keel-like, length about 0.4–0.5 times basal width (fig. 120), in ventral view appears as narrow triangular shape (fig. 121), preanal appendages small, rounded in lateral view (fig. 120). Segment X lateral lobes robust basally, tapered distally, apices acute, sensilla not discerned (figs 120, 121), in lateral view apices angled posteroventrally below phallus (fig. 120). Phallus with two slender spines included subapically. Inferior appendages broadest near midlength, tapered slightly distally, apices narrowly rounded (figs 120–122), in lateral view angled horizontally, sub-ovate, length about 3.5 times width, dorsal margin mostly straight, ventral margin slightly convex (fig. 120), in ventral view mesal and lateral margins slightly curved, mesal margin subapically with acute triangular process (fig. 121).

*Female.* Unknown.

*Etymology.* *Unidentata* – Latin term for with (one) spike, tooth, toothed (inferior appendages).

*Remarks.* *Chimarra unidentata* is known from the type locality in south-east PNG.

#### ***Chimarra stella* sp. nov.**

Figures 123–125

*Holotype.* Male (dried, pinned specimen CT-340 figured), Indonesia, Papua Province, Star Range, 1300 m, about 5° 00' S, 141° 00' E, 28 June 1959, Leiden Museum, Netherlands, New Guinea exp. (RMNH).

*Diagnosis.* The male of *C. stella* can be separated from all other New Guinea species, in particular *C. goroca*, by the combination of the pair of unique hooked spines partly embedded subapically in the phallus, the downturned lateral lobes of segment X and the sub-triangular inferior appendages, in lateral view.

*Description.* General body colour and wings fawn (faded). Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.8 mm. Forewing with forks 1, 2, 3 and 5 present, Rs moderately sinuous or curved, moderately thickened, basad of discoidal cell; hind wing with fork 1 apparently absent, forks 2, 3 and 5 present.

*Male genitalia.* Segment IX anterior margin in lateral view, with angular extension ventrally (fig. 123), ventral process on segment IX short, basal to distal margin of segment IX (figs 123, 124), in lateral view, broad, keel-like, length about 0.4 times basal width (fig. 123), in ventral view, slender (fig. 124), preanal appendages, in lateral view rounded (fig. 123), in dorsal view appear slender, apices acute (fig. 125). Segment X lateral lobes robust, tapered distally, apices broad, sub-truncate, sensilla not discerned (figs 123, 124), in lateral view directed posteroventrally (fig. 123), in ventral view, inner margin slightly concave, apices almost touching (fig. 124). Phallus with two spines partly included subapically and one elongate internal spine near midlength (figs 123–125), in lateral view subapical spines strongly hooked, acute apices project distally near apex of phallus (fig. 123). Inferior appendages broadest in basal half, tapered strongly distally, apices directed posteromesally, acute (figs 123–125), in lateral view angled at about 60° to horizontal, sub-triangular, length about twice width, dorsal margin slightly convex, ventral margin angled at right angles near base, narrowed near midlength, slightly concave in distal half (fig. 123), in ventral view, mesal and lateral margins slightly curved, slender in distal third (fig. 124).

*Female.* Unknown.

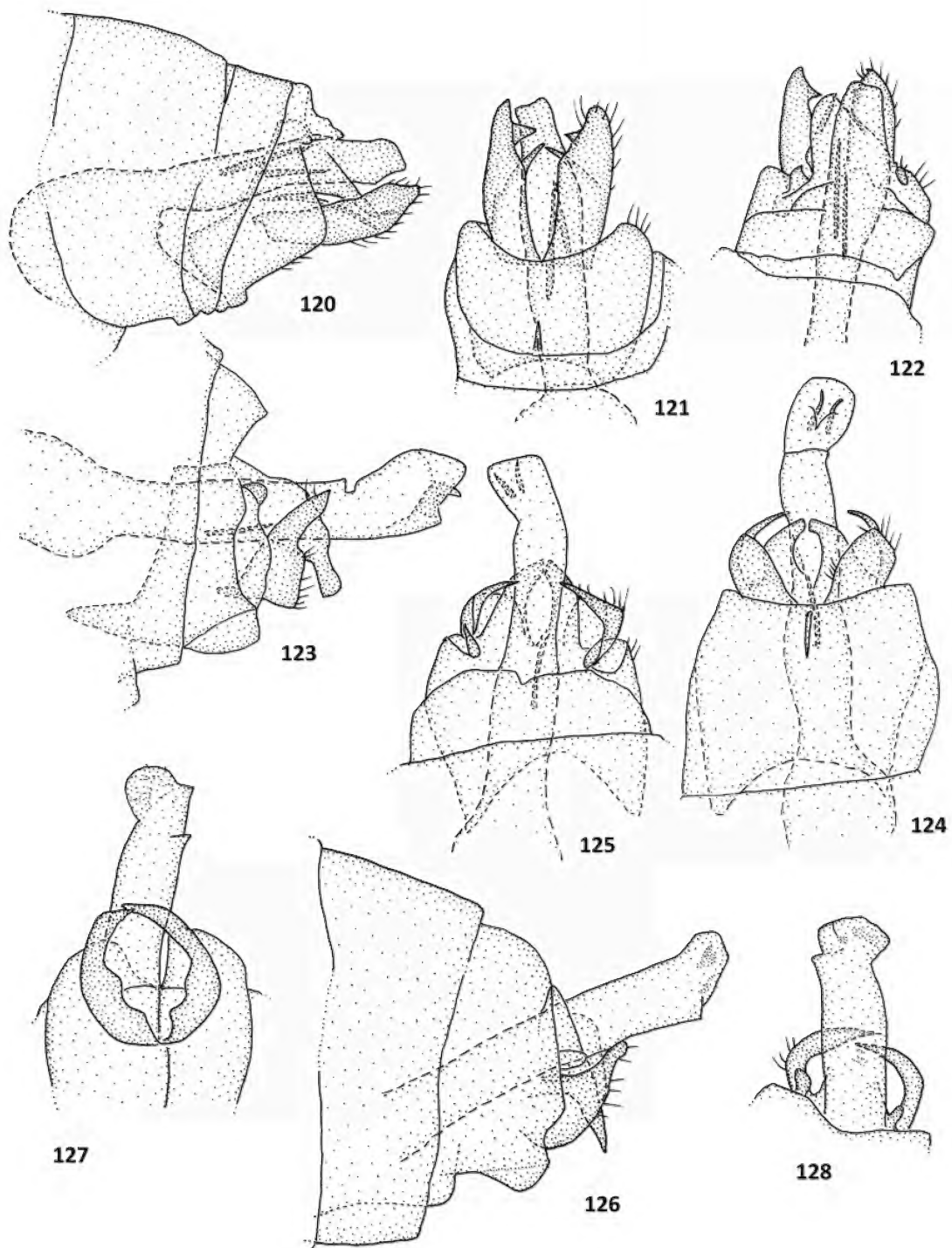
*Etymology.* *Stella* – Latin for star (named for the type locality).

*Remarks.* *Chimarra stella* is known from the type locality in eastern West Papua.

#### ***Chimarra aliciae* sp. nov.**

Figures 126–128

*Holotype.* Male (in alcohol, figured specimen CT-337), PNG, Central Province, soak on Bulola side range on Bulola-Aseki Rd, about 7° 17' S, 146° 30' E, 5 June 1986, A. Wells (NMV, T-22467).



Figures 120–128. *Chimarra* spp.; 120–122, *Chimarra unidentata* sp. nov., male, holotype, genitalia; 120, lateral; 121, ventral, 122, dorsal. 123–125, *Chimarra stella* sp. nov., male, holotype, genitalia; 123, lateral; 124, ventral, 125, dorsal. 126–128, *Chimarra alicae* sp. nov., male, holotype, genitalia; 126, lateral; 127, ventral; 128, dorsal.

**Diagnosis.** The male of *C. alicae* can be separated from all other New Guinea species by the combination of the strongly downturned, hook-like lateral lobes of segment X and the short, sub-semicircular inferior appendages in lateral view.

**Description.** General body colour and wings pale (faded). Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.3 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, not thickened, basad of discoidal cell; hind wing with fork 1 apparently absent, forks 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally rounded (fig. 126), ventral process on segment IX, in lateral view broad, keel-like, length about 0.3 times basal width (fig. 126), preanal appendages, in dorsal view ovoid (fig. 128). Segment X lateral lobes short, robust, sensilla not discerned (figs 126, 128), in lateral view hook-like, tapered distally, apices downturned below phallus, apices acute, angled ventrally (fig. 126). Phallus without any obvious included spines. Inferior appendages broadest in basal half, tapered distally, apices directed posteromesally, acute (figs 126–128), in lateral view, angled at about 30° to horizontal, length about twice width, appear sub-semicircular, dorsal margin slightly concave, ventral margin convex, apices narrowly rounded (fig. 126), in ventral view, mesal margin irregularly concave, lateral margins strongly convex (fig. 127).

**Female.** Unknown.

**Etymology.** *Alicae* – named for Alice Wells (collector and tireless editor of early drafts of this and many of my other manuscripts).

**Remarks.** *Chimarra alicae* is known from the type locality in south-east PNG.

### ***Chimarra wara* sp. nov.**

Figures 129–131

**Holotype.** Male (figured specimen CT-347), PNG (Western Highlands Province), Baiyer River sanctuary, 5° 30' S, 144° 10' E, 16 June 1986, A. Wells (NMV, T-22468).

**Paratypes.** PNG. 6 males, (Western Highlands Province), Baiyer River sanctuary, Trauna River, 5° 35' S, 144° 10' E, UV light, 17 June 1986, A. Wells (NMV).

**Diagnosis.** The males of *Chimarra wara* can be separated from other New Guinea species, particularly *C. ediana*, *C. milneana*, *C. karamui* and *C. cavata*, by the combination of small features on the inferior appendages, which in lateral view have an acute angular projection present on the mid ventral margin and distal to this is narrowed strongly to a curved digitiform shape.

**Description.** General body colour and wings fawn (faded) to light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.0–6.0 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, moderately thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally rounded (fig. 129), ventral process on segment IX short, strongly basal to distal margin of segment IX (figs

129, 130), in lateral view, weakly keel-like, length about 0.35 times basal width (fig. 129), in ventral view appears triangular (fig. 130). Preanal appendages, in lateral view rounded (fig. 129), in dorsal view appear rounded or more acute distally (fig. 131). Segment X lateral lobes both laterad and ventral to phallus, with sensilla not discerned (figs 129, 131), in lateral view, lobes laterad to phallus robust and spine-like ventral to phallus (fig. 129), in ventral and dorsal views, lobes laterad of phallus with disto-lateral margins slightly concave, dilated subapically, apices rounded (figs 130, 131), in ventral view, spine-like lobe tapered distally, apex acute (fig. 130). Phallus with two slender spines included subapically (figs 130–131). Inferior appendages robust in basal half, tapered and slender in distal third, apices slightly inflexed, acute (figs 129–131), in lateral view angled at about 30° to horizontal, length about twice maximum width, dorsal margin slightly sinusoidal, ventral margin with acute angular projection present near midlength, margin concave distally (fig. 129), in ventral view, lateral margins curved, mesal margins with series of small crenulations with attached hairs (fig. 130).

**Female.** Unknown.

**Etymology.** *Wara* – New Guinea pidgin for water, freshwater or river (Locality- habitat).

**Remarks.** *Chimarra wara* is known from seven male specimens collected from the Western Highlands in central PNG.

### ***Chimarra goroka* Sykora, 1967**

Figures 132, 133

*Chimarra goroka* Sykora, 1967: 589; fig. 4.—Neboiss, 1986: 106.

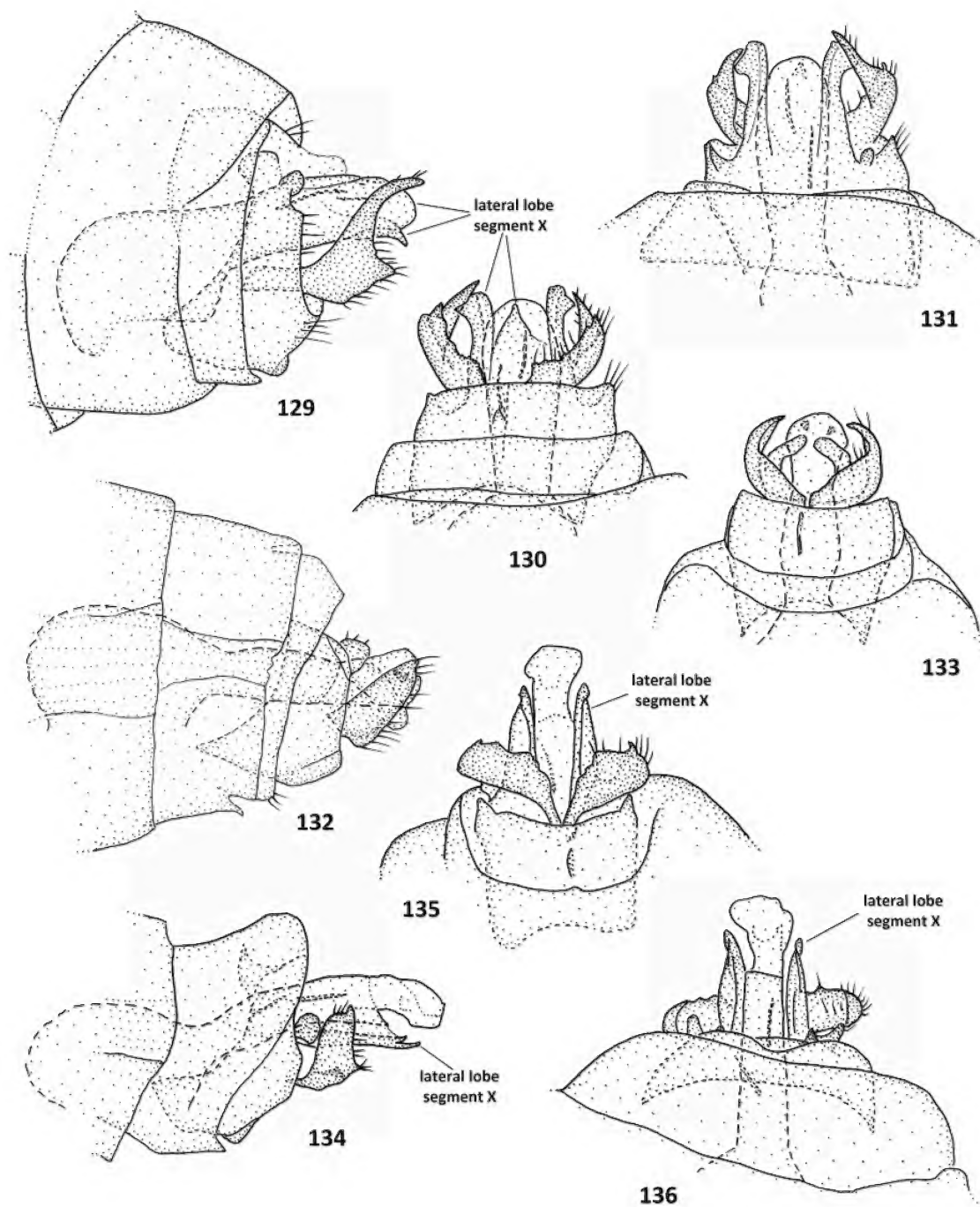
Type material not seen. Holotype. Male, PNG, north-east, Goroka, Omaheka River, 2200 m, 28 September 1966, J. Illies (BPBM, Type 7471).

**Material examined.** 1 male (dried, pinned specimen CT-389, partly figured), PNG, Southern Highlands Province, ridge west of Dimifa, south of Mount Giluwe, 2350 m, about 6° 02' S, 143° 51' E, 11 October 1958, J.L. Gressitt (BPBM).

**Diagnosis.** *Chimarra goroka* can be separated from other New Guinea species particularly *C. stella*, by the combination of the spatulate lateral lobes of segment X and inferior appendages that are broad-based and sub-triangular, the broad-based keel-like ventral process on segment IX, in lateral view and the absence of a pair of large, hooked spines partly embedded subapically in the phallus.

**Description.** (Revised after Sykora, 1967). General body colour and wings light yellowish (Sykora 1967) to brownish. Wings (Sykora, 1967: fig. 4), similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.5–7.0 mm. Forewing with forks 1, 2, 3 and 5 present, Rs straight to slightly sinuous or curved, thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally angular (fig. 132; Sykora 1967: fig. 4A), in lateral view, ventral process on segment IX broad-based, keel-like, length about 0.25 times basal width. Preanal appendages



Figures 129–136. *Chimarra* spp.; 129–131, *Chimarra wara* sp. nov., male, holotype, genitalia; 129, lateral; 130, ventral; 131, dorsal. 132–133, *Chimarra goroca* Sykora, male, genitalia; 132, lateral; 133, ventral. 134–136, *Chimarra huonana* sp. nov., male, holotype, genitalia; 134, lateral; 135, ventral; 136, dorsal.

rounded (fig. 132; Sykora, 1967: fig. 4A; Neboiss, 1986a: fig. p. 106). Segment X lateral lobes angled posteromesally, spatulate, apices rounded, with sensilla not discerned (figs 132, 133; Sykora, 1967: fig. 4A; Neboiss, 1986a: fig. p. 106), in lateral view sub-quadrangle, angled at about 45° posteroventrally, apices below phallus (fig. 132; Sykora, 1967: fig. 4A; Neboiss, 1986a: fig. p. 106). Phallus with two small, hooked, internal spines subapically (figs 132, 133) and an elongate spine more basally (Sykora, 1967: fig. 4E; Neboiss, 1986a: fig. p. 106). Inferior appendages tapered slightly in distal third, apices angled posteromesally, acute (figs 132, 133; Sykora, 1967: figs 4A–C; Neboiss, 1986a: fig. p. 106), in lateral view appear sub-triangular, broad-based, angled at about 45° to horizontal, length about 2.3 times width (fig. 132; Sykora, 1967: fig. 4A).

*Female.* Unknown.

*Remarks.* *Chimarra goroca* is known from two males from two sites in central and north-east PNG, with both males collected at relatively high altitudes. New figures have been drawn to allow direct comparisons and to accompany the description that is revised in light of new interpretations of *Chimarra* genitalic structures from Sykora's (1967) original description.

### ***Chimarra huonana* sp. nov.**

Figures 134–136

Holotype. Male (figured specimen CT-387), PNG, Morobe Province, Finschhafen, Huon peninsula, 80 m, 6° 34' S, 147° 51' E, Malaise trap, 14 April 1963, J. Sedlacek (BPBM).

*Diagnosis.* The male of *Chimarra huonana* can be separated from other New Guinea species, by the unique shape of the inferior appendages, which are very narrow basally, short, robust and irregular shaped.

*Description.* General body colour and wings brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.3 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, slightly thickened, basad (fig. 135).

*Male.* Segment IX anterior margin in lateral view, anteroventrally angular (fig. 134), ventral process on segment IX strongly basal to distal margin of segment IX (figs 134, 135), in lateral view, weakly keel-like, length about 0.25 times basal width. Preanal appendages, laterally compressed (figs 134, 136), in lateral view rounded (fig. 134), in dorsal view appear bifid, apices narrowly rounded (fig. 136). Segment X lateral lobes laterad of phallus, plate-like, laterally compressed, with sensilla not discerned (figs 134, 136), in lateral view robust, aligned level with and below phallus, apices appear acute and bifid (fig. 134). Phallus with two slender spines included subapically and near midlength (figs 134–136). Inferior appendages narrowed basally, robust in distal two thirds, directed dorsolaterally (figs 134, 135), in lateral view angled at about 80° to horizontal, length about 2.2 times width with irregular margins, dorsal margin sinusoidal, ventral margin with acute angular projections present near midlength (fig. 134), in ventral view lateral margins strongly curved, mesal margins somewhat irregular (fig. 135).

*Female.* Unknown.

*Etymology.* *Huonana* – named for the type locality (Huon Peninsula).

*Remarks.* *Chimarra huonana* is known from the type locality in north-east PNG.

### ***Chimarra missim* sp. nov.**

Figures 137–139

Holotype. Male (dried, pinned specimen PT-1248 figured), PNG, Morobe Province, near Wau, Mount Missim, 1200 m, 7° 15' S, 146° 48' E, Malaise trap, 27 May 1966, J.L. Gressitt (BPBM).

Paratypes. PNG. 2 males (dried, pinned specimens PT-1247, 1249), collected with holotype (BPBM).

*Diagnosis.* *Chimarra missim* can be separated from other New Guinea species, particularly *C. denticulata*, by the inferior appendages which have a broadly crenulate mesal margin in lateral view and laterally compressed, slightly downturned lateral processes on segment X.

*Description.* General body colour and wings light brown. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.2–5.4 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, not thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

*Male.* Segment IX anterior margin in lateral view, anteroventrally rounded (fig. 137), ventral process on segment IX basal to distal margin of segment IX (figs 137, 138), in lateral view weakly keel-like, length about 0.25 times basal width. Preanal appendages relatively large, laterally compressed (figs 137, 139), in lateral view rounded (fig. 137), in dorsal view appear digitiform (fig. 139). Segment X lateral lobes aligned alongside phallus, robust, laterally compressed, with sensilla not discerned (figs 137, 139), in lateral view tapered in distal quarter, angled posteroventrally (fig. 137). Phallus without any obvious included spines (figs 137–139). Inferior appendages elongate, apices acute, angled posteromesally (figs 137, 138), in lateral view angled at about 30° to horizontal, broadest in basal half, tapered slightly distally, length about 3.5 times width with dorsal margin slightly concave, ventral margin widely crenulate (fig. 137), in ventral view lateral and mesal margins curved (fig. 138).

*Female.* Unknown.

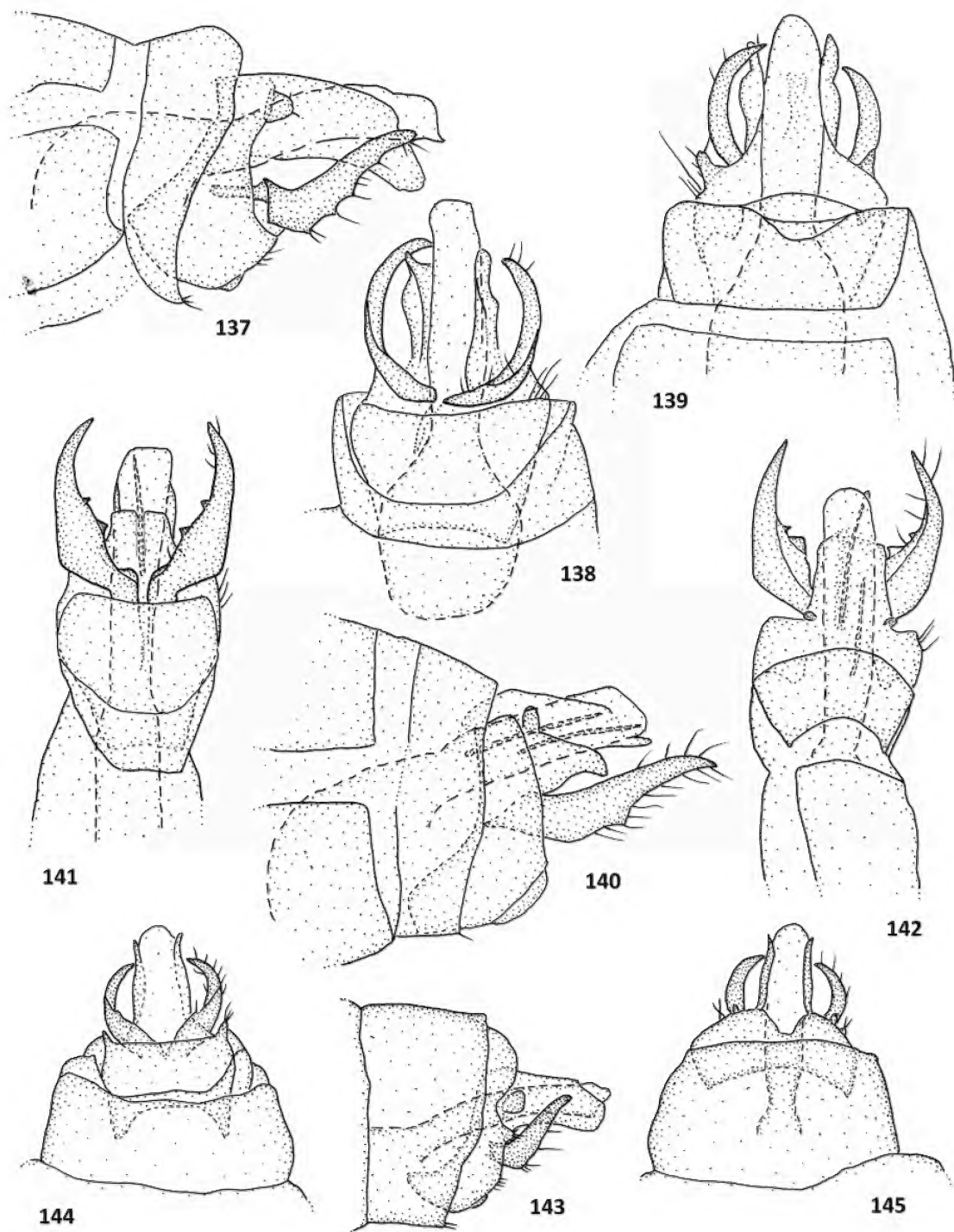
*Etymology.* *Missim* – named for the type locality (Mount Missim).

*Remarks.* *Chimarra missim* is known from three males collected from the type locality in north-east PNG.

### ***Chimarra denticulata* sp. nov.**

Figures 140–142

Holotype. Male (dried, pinned specimen PT-1393 figured), PNG, Morobe Province, near Wau, Mount Missim, 1600 m, 7° 20' S, 146° 43' E, Malaise trap, 25 April 1966, J.L. Gressitt and O.R. Wilkes (BPBM).



Figures 137–145. *Chimarra* spp.; 137–139, *Chimarra missim* sp. nov., male, holotype, genitalia; 137, lateral; 138, ventral; 139, dorsal. 140–142, *Chimarra denticulata* sp. nov., male, holotype, genitalia; 140, lateral; 141, ventral; 142, dorsal. 143–145, *Chimarra sepikana*, male, holotype, genitalia; 143, lateral; 144, ventral; 145, dorsal.

**Diagnosis.** The male of *Chimarra denticulata* can be separated from other New Guinea species, particularly *C. missim*, by the shape of the inferior appendages, which have two prominent teeth on the mesal margin in ventral view and the broad, keel shaped ventral process on segment IX.

**Description.** General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7), length of forewing: male 4.6 mm. Forewing with forks 1, 2, 3 and 5 present, Rs sinuous or curved, thickened, basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, anteroventrally rounded (fig. 140), ventral process in lateral view broad, weakly keel-like, length about 0.2 times basal width (fig. 140). Preanal appendages, in lateral view ovate (fig. 140), in dorsal view appear rounded (fig. 142). Segment X lateral lobes laterad and ventral to phallus, with sensilla not discerned (figs 140, 142), in lateral view appear tapered distally (fig. 140), in ventral view lobes appear tongue-shaped (fig. 141). Phallus with two elongate, slender spines included subapically (figs 140–142). Inferior appendages broadest in basal half, tapered in distal half, apices directed posteriorly, acute (figs 140, 141), in lateral view angled at about 30° to horizontal, length about 4.5 times width with dorsal margin nearly straight, ventral margin with angular projection present near midlength (fig. 140), in ventral view lateral margins slightly curved, mesal margins curved with two prominent teeth near midlength (figs 141, 142).

**Female.** Unknown.

**Etymology.** *Denticulata* – Latin for finely toothed, serrated (two teeth on inner margin of inferior appendages).

**Remarks.** *Chimarra denticulata* is known from the type locality in north-east PNG.

### ***Chimarra sepikana* sp. nov.**

Figures 143–145

Holotype. Male (dried, pinned specimen CT-371 figured), PNG, East Sepik Province, Angoram, 28–30 m, about 4° 04' S, 144° 03' E, 14–16 August 1969, J.L. Gressitt (BPBM).

Other material examined. 1 male (CT-404), PNG, north-east, Bulem River, 64 km north-east Lae, 30 m, about 6° 30' S, 147° 01' E, 29 April 1963, J. Sedlacek (BPBM).

**Diagnosis.** The males of *C. sepikana* can be separated from all other New Guinea species, including *C. aiyura* Korboot, *C. felholda* and *C. simbuensis*, by the combination of the very weak keel-like ventral process on segment IX, the lateral lobes of segment X which are laterally compressed and the slender, sub-triangular inferior appendages, in lateral view.

**Description.** General body colour and wings fawn (faded) to light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.4 (specimen CT-404) – 6.2 (specimen CT-371) mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, very slightly thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally narrowly rounded, ventral process on segment IX, in lateral view, weakly keel-like, length about 0.2 times basal width, preanal appendages, laterally compressed, rounded in lateral view (fig. 143), appear finger-like in dorsal view (figs 145). Segment X with lateral lobes laterally compressed, aligned alongside phallus, sensilla not discerned (figs 143, 145), in lateral view robust, broadly rounded distally (fig. 143), in ventral and dorsal views appear slender (figs 144, 145). Phallus with no obvious included spines (figs 143–145). Inferior appendages broadest in basal third, tapered gradually distally, slender in distal half, apices directed posteromesally, acute (figs 143, 145), in lateral view angled at about 45° to horizontal, length about 3.5 times width, slender, sub-triangular, dorsal margin mostly straight, ventral margin slightly angled in basal half (fig. 143), in ventral and dorsal views lateral margins curved (figs 144, 145).

**Female.** Unknown.

**Etymology.** *Sepikana* – named for the type locality (Sepik Region of PNG).

**Remarks.** *Chimarra sepikana* is known from the holotype male specimen from north PNG. A second male from north-east PNG, about 420 km east of the type locality, is here attributed to *C. sepikana*, but is smaller and differs slightly in the shape of the lateral lobes of segment X, which are out-turned distally.

### ***Chimarra lindyae* sp. nov.**

Figures 146–148

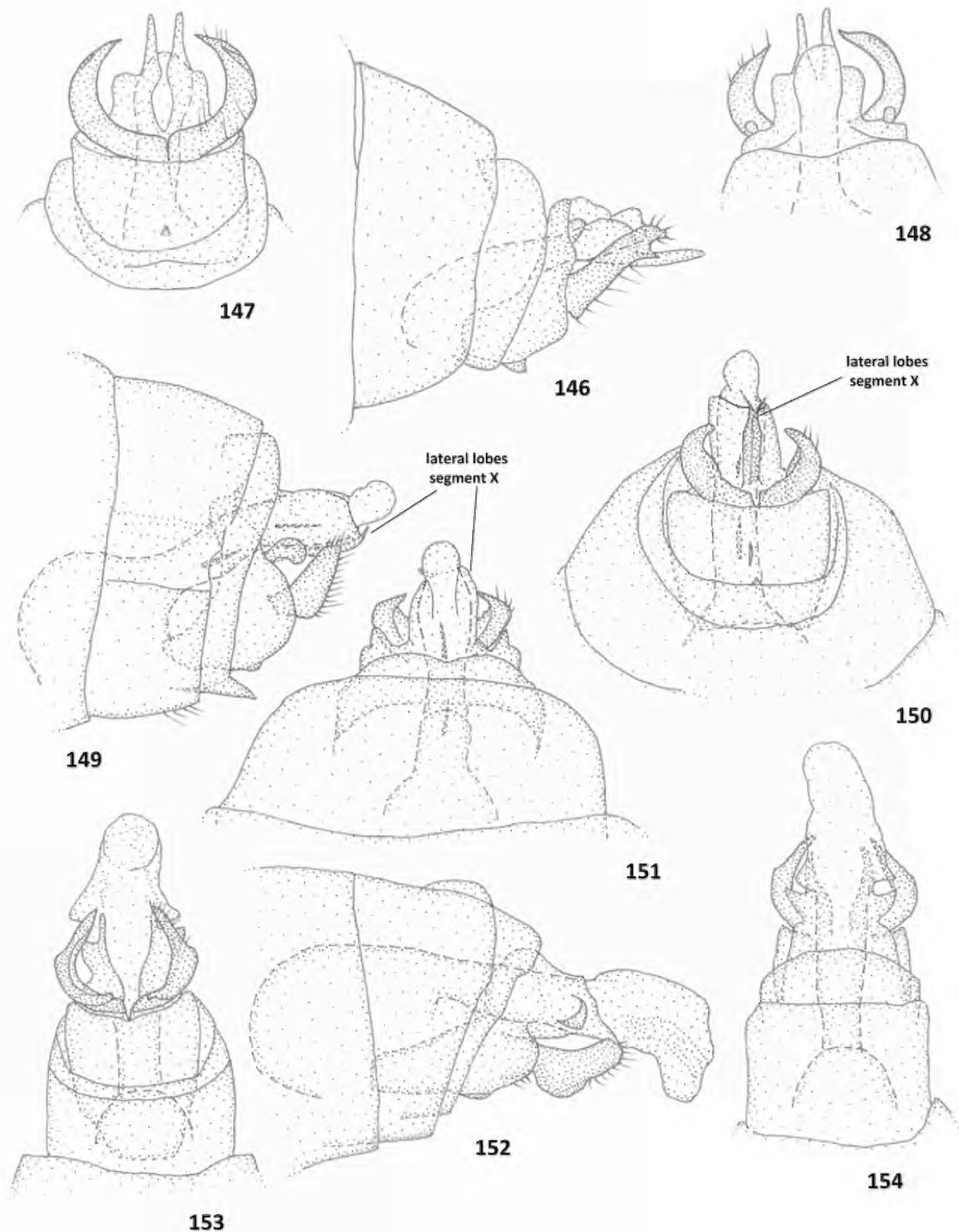
Holotype. Male (specimen in alcohol, CT-715 figured), PNG, West Highlands Province, Peregai, 1250 m, about 6° 09' S, 144° 11' E, 14 June 1986, A. Wells (NMV, T-22475).

Paratypes. PNG. 6 males, collected with holotype (NMV).

**Diagnosis.** The males of *C. lindyae* can be separated from all other New Guinea species, by the presence of a short, acute, subapical process on the inferior appendages.

**Description.** General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.3–6.1 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, strongly thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally rounded (fig. 146), ventral process on segment IX, in lateral view, short, keel-like, length about 0.4–0.5 times basal width, preanal appendages ovoid in lateral and dorsal views (figs 146, 148). Segment X lateral lobes aligned alongside and below phallus, broad basally, narrowed near midlength, slender in distal third, apices rounded, sensilla not discerned. Phallus without any obvious included spines (figs 146–148). Inferior appendages elongate with short acute process subapically, apices acute, directed posteromesally (figs 146, 147), in lateral view, angled at about 45° to horizontal, length about 3.7 times width, appear sub-rectangular, dorsal and ventral margins mostly straight, subapical process forms a concavity with apex (fig. 146), in ventral and dorsal views lateral margins curved (figs 147, 148).



Figures 146–154. *Chimarra* spp.; 146–148, *Chimarra lindyae* sp. nov., male, holotype, genitalia; 146, lateral; 147, ventral; 148, dorsal. 149–151, *Chimarra kebarana* sp. nov., male, holotype, genitalia; 149, lateral; 150, ventral; 151, dorsal. 152–154, *Chimarra simbuensis* sp. nov., male, holotype, genitalia; 152, lateral; 153, ventral; 154, dorsal.

*Female.* Unknown.

*Etymology.* *Lindya* – named for Lindy Cartwright, whose support and encouragement has been invaluable during this long project.

*Remarks.* *Chimarra lindya* is known from seven male specimens from central PNG.

***Chimarra kebarana* sp. nov.**

Figures 149–151

*Holotype.* Male (dried, pinned specimen CT-379 figured), Indonesia, Papua Province, Vogelkop, Kebar Valley, W of Manokwari, 550 m, about 0° 52' S, 134° 05' E, 4–31 January 1962, S. and L. Quate (BPBM).

*Paratype.* Indonesia. Male (dried, pinned specimen CT-380), Papua Province, Oransbari, south of Manokwari, 3 m, about 1° 21' S, 134° 16' E, 12 February 1963, R. Straatman (BPBM).

*Diagnosis.* The males of *C. kebarana* can be separated from all other New Guinea species, in particular *C. oláhi*, *C. aiya* Korboot and *C. falcata* Kimmins, by the combination of the shape of the lateral lobes of segment X, which are situated laterad of and below the phallus and appear as a pair of slender processes ventral to the phallus, which diverge subapically and the short, sub-triangular inferior appendages, in lateral view.

*Description.* General body colour and wings light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 5.4–5.7 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, slightly thickened, basad of discoidal cell.

*Male.* Segment VIII with acute ventral process. Segment IX anterior margin in lateral view, anteroventrally narrowly rounded (fig. 149), ventral process on segment IX, in lateral view, very weakly keel-like, length about 0.2 times basal width, preanal appendages, in lateral view rounded, narrowed basally (fig. 149), in dorsal view appear sub-triangular (fig. 151). Segment X lateral lobes laterad of and ventral to the phallus (hard to discern), sensilla not discerned (figs 149, 151), in lateral view apices appear acute (fig. 149), in ventral view lateral lobes appear as pair of slender processes, apices acute, directed slightly outwardly (fig. 150). Phallus with two slender, subapical internal spines (figs 149–151). Inferior appendages broadest in basal half, tapered gradually distally, apices acute, directed posteromesally (figs 149, 150), in lateral view angled at about 45° to horizontal, length about 2.3 times width, appear sub-triangular, dorsal margin mostly straight, ventral margin right angled in basal third, sub-truncate distally (fig. 149), in ventral and dorsal views lateral margins curved (figs 150, 151).

*Female.* Unknown.

*Etymology.* *Kebarana* – named for the type locality (Kebar Valley of Indonesian Papua).

*Remarks.* *Chimarra kebarana* is known only from two male specimens from north-east Papua.

***Chimarra simbuensis* sp. nov.**

Figures 152–154

*Holotype.* Male (dried, pinned specimen CT-396 figured), PNG, Simbu (Chimbu) Province, ca north-west of Lake Piunde, 3600–3800 m, about 5° 47' S, 145° 04' E, 14–16 August 1969, J.L. Gressitt (BPBM).

*Paratype.* PNG. Male (dried, pinned specimen CT-395), Simbu (Chimbu) Province, Mount Wilhelm, 3560+ m, 5°44'S, 145°04'E, 1–9 Aug 1969, J.L. Gressitt (BPBM).

*Diagnosis.* The males of *C. simbuensis* can be separated from all other New Guinea species, by the unique lateral protuberances on the phallus and the basi-ventral 'flange' on the inferior appendages. It shares with *C. oláhi* the character of ventral 'flanges' on the inferior appendages.

*Description.* General body colour and wings fawn to light brownish. Wings similar to those of *C. ukarumpuna* (fig. 7). Length of forewing: male 4.6–5.8 mm. Forewing with forks 1, 2, 3 and 5 present, Rs straight, not sinuous or curved, not thickened, basad of discoidal cell.

*Male.* Segment IX anterior margin in lateral view, with rounded extension ventrally (fig. 152), ventral process on segment IX, in lateral view very weakly keel-like, length about 0.2 times basal width, preanal appendages, rounded in lateral view (fig. 152), in dorsal view appear sub-triangular (fig. 154). Segment X lateral lobes laterad of phallus, sensilla not discerned (figs 152, 154), in lateral view robust (fig. 152), in ventral view slender in distal third (fig. 153). Phallus with no obvious included spines but with pair of triangular, lateral protuberances or fins subapically (figs 153, 154). Inferior appendages broadest in basal half, with a flange baso-ventrally, tapered gradually distally, apices acute, directed posteromesally (figs 152, 153), in lateral view aligned horizontally, robust, length about 1.9 times width, appear sub-ovoid, dorsal margin slightly concave, ventral margin slightly convex in basal half, apices broadly rounded (fig. 152), in ventral view lateral margins curved (fig. 153).

*Female.* Unknown.

*Etymology.* *Simbuensis* – named for the type locality (Simbu Province of PNG).

*Remarks.* *Chimarra simbuensis* is known from two male specimens from two very high-altitude localities in central PNG.

***Chimarra maai* sp. nov.**

Figures 155–157

*Holotype.* Male (dried, pinned specimen CT-377 figured), Indonesia, Papua Province, Bodem, 11 km south-east of Oerberfaren, 100 m, about 1° 58' S, 138° 44' E, 7–17 Jul 1959, T.C. Maa (BPBM).

*Diagnosis.* The male of *C. maai* can be separated from all other New Guinea species, including *C. pinga* Cartwright, by the combination of the field of small, dark spines at the apex of the phallus and the shape of the inferior appendages, which are narrowed at about the middle, in lateral view.

*Description.* General body colour and wings light brownish (badly damaged).

**Male.** Segment IX anterior margin in lateral view, anteroventrally weakly angled (fig. 155), ventral process on segment IX, not discerned (specimen slightly damaged?; figs 155, 156), preanal appendages relatively large, laterally compressed, rounded in lateral view (fig. 155), in dorsal view appear sub-triangular (fig. 157). Segment X lateral lobes laterad of phallus, robust, apices widely rounded, sensilla not discerned. Phallus with one slender spine included subapically (figs 155–157). Inferior appendages broadest in basal half, narrowed near midlength, slender in distal half, apices acute, directed posteriorly (figs 155, 156), in lateral view angled at about 60° to horizontal, length about 3.5 times width, dorsal margin almost straight, ventral margin slightly convex in basal half and straight in distal half (fig. 155), in ventral view mesal and lateral margins slightly curved (fig. 156).

**Female.** Unknown.

**Etymology.** Maai – named for T.C. Maa (collector).

**Remarks.** *Chimarra maai* is known only from Papua.

### ***Chimarra supia* sp. nov.**

Figures 158–160

**Holotype.** Male (figured specimen CT-342), PNG, (Morobe Province), Wau, 1670 m, about 7° 20' S, 146° 43' E, March 1984, T. New (NMV, T-22482).

**Paratype.** Male (CT-391), PNG, south-east, Milne Bay (about 10° 22' S, 150° 30' E), Malaise Trap, 14–23 February 1969, J. and M. Sedlacek (BPBM).

**Diagnosis.** *Chimarra supia* can be separated from all other New Guinea species by the combination of the spine-like ventral process on the phallus (or phallobase) and semicircular shaped inferior appendages in lateral view together with the shape of the lateral lobes of segment X, which are dilated sub-apically in dorsal view, similarly to *C. bicuspidis* and *C. karimui*.

**Description.** General body colour and wings pale to fawn (faded). Wings similar to those of *C. ukarumpana* (fig. 7). Length of forewing: male 5.1–5.3 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, slightly thickened, basad of discoidal cell.

**Male.** Segment IX anterior margin in lateral view, with broadly rounded extension ventrally (fig. 158), ventral process on segment IX, not obvious (figs 158, 159), preanal appendages sub-triangular in lateral and dorsal views (figs 158, 160). Segment X lateral lobes laterad of phallus, apices narrowly rounded, with sensilla not discerned (figs 158, 160), lateral lobes in lateral view appear tapered distally (fig. 158), in dorsal and ventral views with subapical, triangular barbs (figs 158, 160). Phallus with two small spines included subapically and a robust, partly emergent spine disto-ventrally (figs 158, 159). Inferior appendages robust, broadest near middle, tapered basally and distally, apices directed dorsomesally, subacute (figs 158–160), in lateral view appear semicircular, angled at about 45° to horizontal, length about 2.2 times width, dorsal margin almost straight and ventral margin strongly convex, slightly crenulate in distal half (fig. 158), in dorsal view lateral margins slightly curved (fig. 160).

**Female.** Unknown.

**Etymology.** *Supia* – New Guinea pidgin for spear (lateral lobes of segment X, in dorsal and ventral views).

**Remarks.** *Chimarra supia* is known from two male specimens from two localities in north-east and south-east PNG, separated by about 530 km in a straight line.

### ***Chimarra ismayi* sp. nov.**

Figures 161–163

**Holotype.** Male (figured specimen PT-1778), PNG, Oro Province, Myola 2, 2080 m, forest river, about 9° 05' S, 147° 42' E, 26 July 1986, J. W. Ismay (NMV, T-22483).

**Diagnosis.** *Chimarra ismayi* can be separated from all other New Guinea species by the shape of the inferior appendages, which are short and robust with an acute, mesal, subapical process. Superficially the shape of the inferior appendages seems most similar to south-east Asian species such as *C. concolor* Ulmer and *C. spinifera* Kimmins.

**Description.** General body colour and wings fawn (faded). Wings similar to those of *C. ukarumpana* (fig. 7). Length of forewing: male 5.1 mm. Forewing with forks 1, 2, 3 and 5 present, Rs slightly sinuous or curved, moderately thickened, basad of discoidal cell; hind wing with forks 1, 2, 3 and 5 present.

**Male.** Segment IX anterior margin in lateral view, anteroventrally weakly angled, distal margin broadly rounded (fig. 161), ventral process on segment IX, not obvious (figs 161, 162), preanal appendages in lateral view ovoid (fig. 161), in dorsal view appear irregular (fig. 163). Segment X mesal lobe damaged?, lateral lobes dorso-ventrally flattened in distal third, with sensilla not discerned (figs 161, 163), in lateral view, tapered distally (fig. 161). Phallus not discerned (or has been removed?; figs 161, 162). Inferior appendages short, robust with triangular, meso-subapical process (figs 161–163), in lateral view appear ovoid, aligned horizontally, length about 1.8 times width, broadest near midlength, dorsal and ventral margins convex, broadly rounded distally (fig. 161), in ventral and dorsal views, lateral margins slightly convex (figs 162, 163).

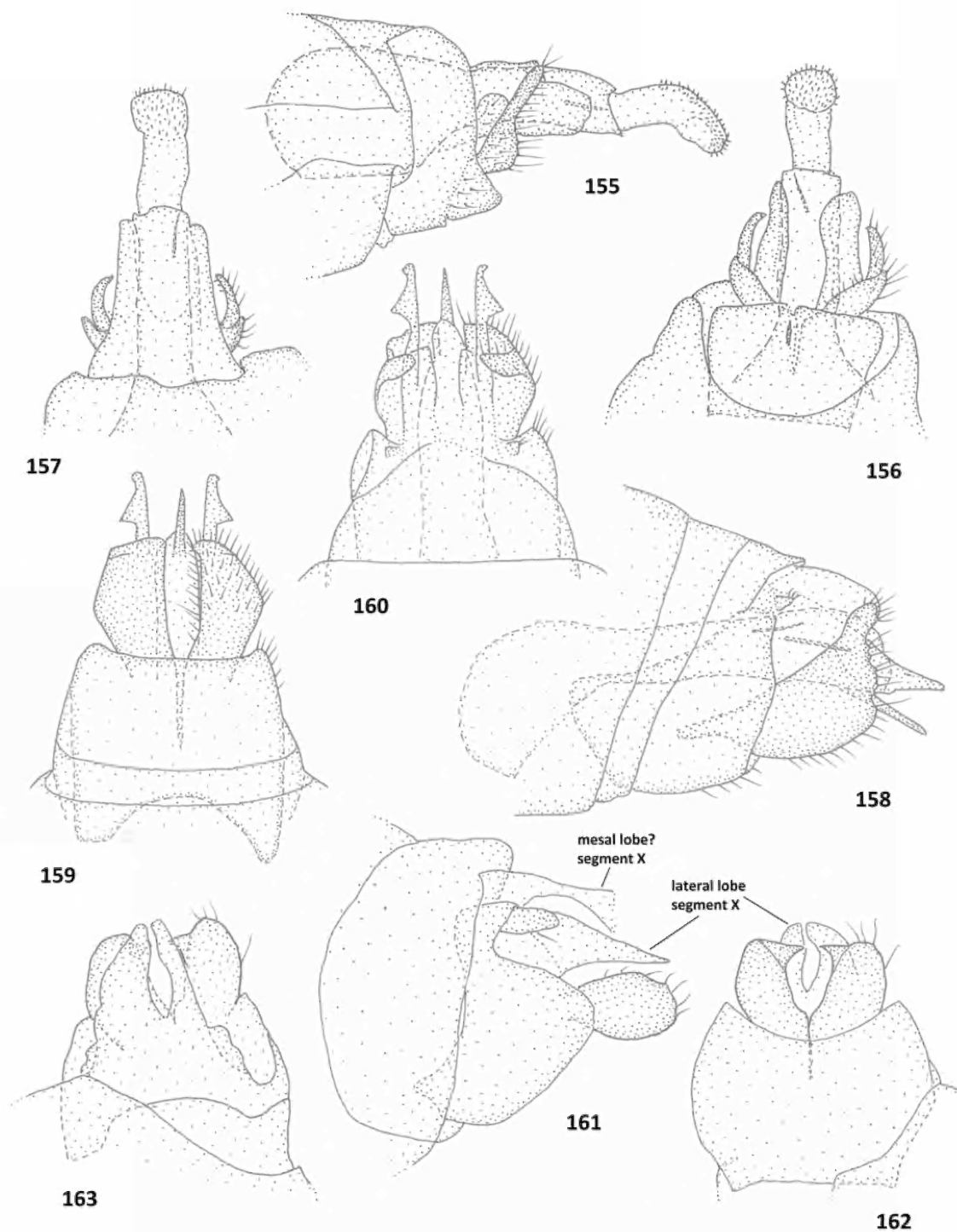
**Female.** Unknown.

**Etymology.** *Ismayi* – named for J.W. Ismay (collector).

**Remarks.** *Chimarra ismayi* is known from the holotype male specimen from south-east PNG. This specimen has probably been damaged slightly with the possible removal of the phallus?

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I thank the late Dr Arturs Neboiss, together with Dr Alice Wells, for providing access to the specimens; Alice for her time in giving extremely incisive and helpful advice on earlier drafts of this manuscript; and the referee(s) for extremely constructive comments on this manuscript. I am indebted to my wife, Lindy, and my family for financial and moral support during the extended duration of this project.



Figures 155–161. *Chimarra* spp.; 155–157, *Chimarra maai* sp. nov., male, holotype, genitalia; 155, lateral; 156, ventral; 157, dorsal. 158–160, *Chimarra supia* sp. nov., male, holotype, genitalia; 158, lateral; 159, ventral; 160, dorsal. 161–163, *Chimarra ismayi* sp. nov., male, holotype, genitalia; 161, lateral; 162, ventral; 163, dorsal.

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